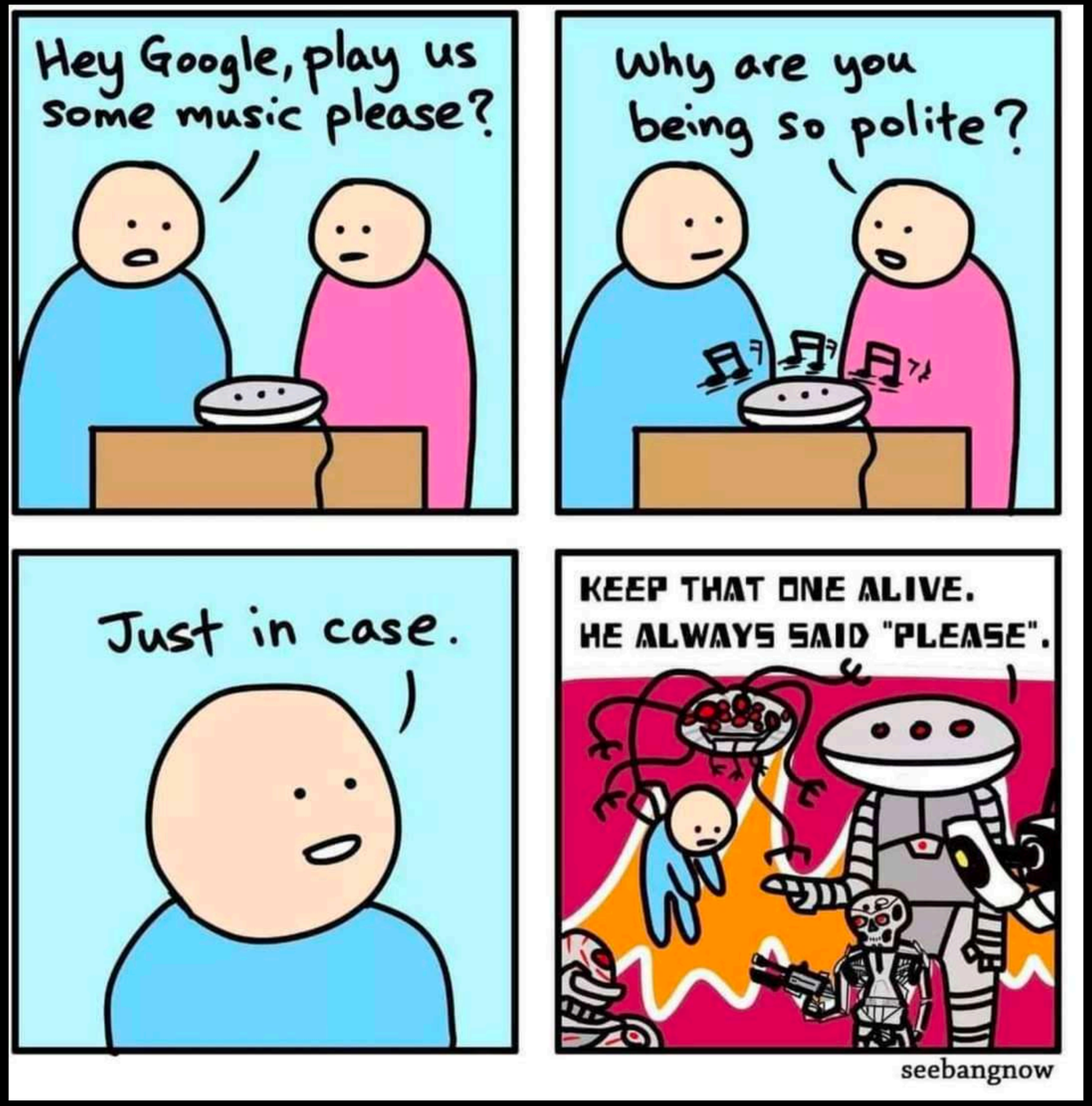
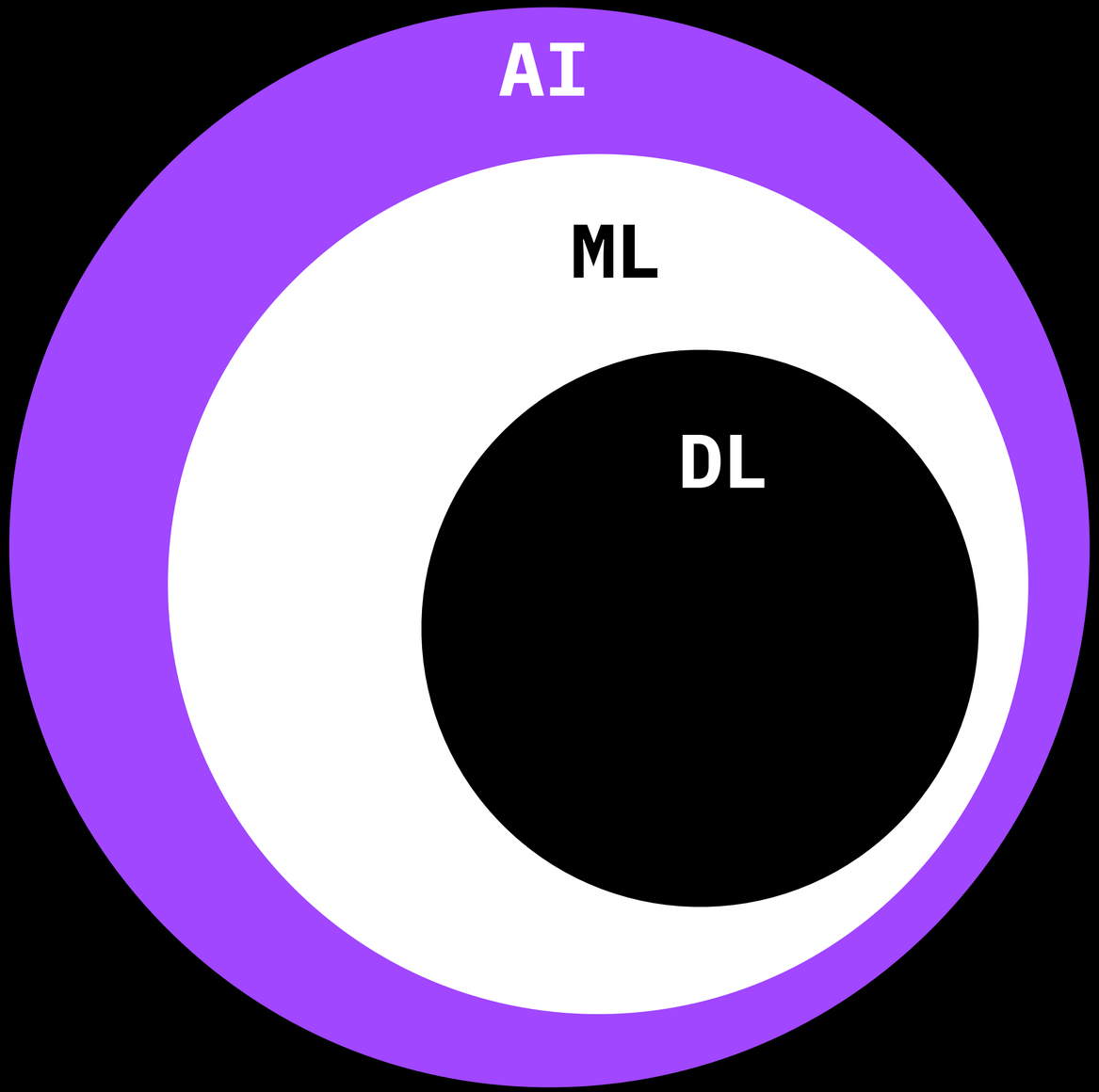
Machine Learning

A brief overview

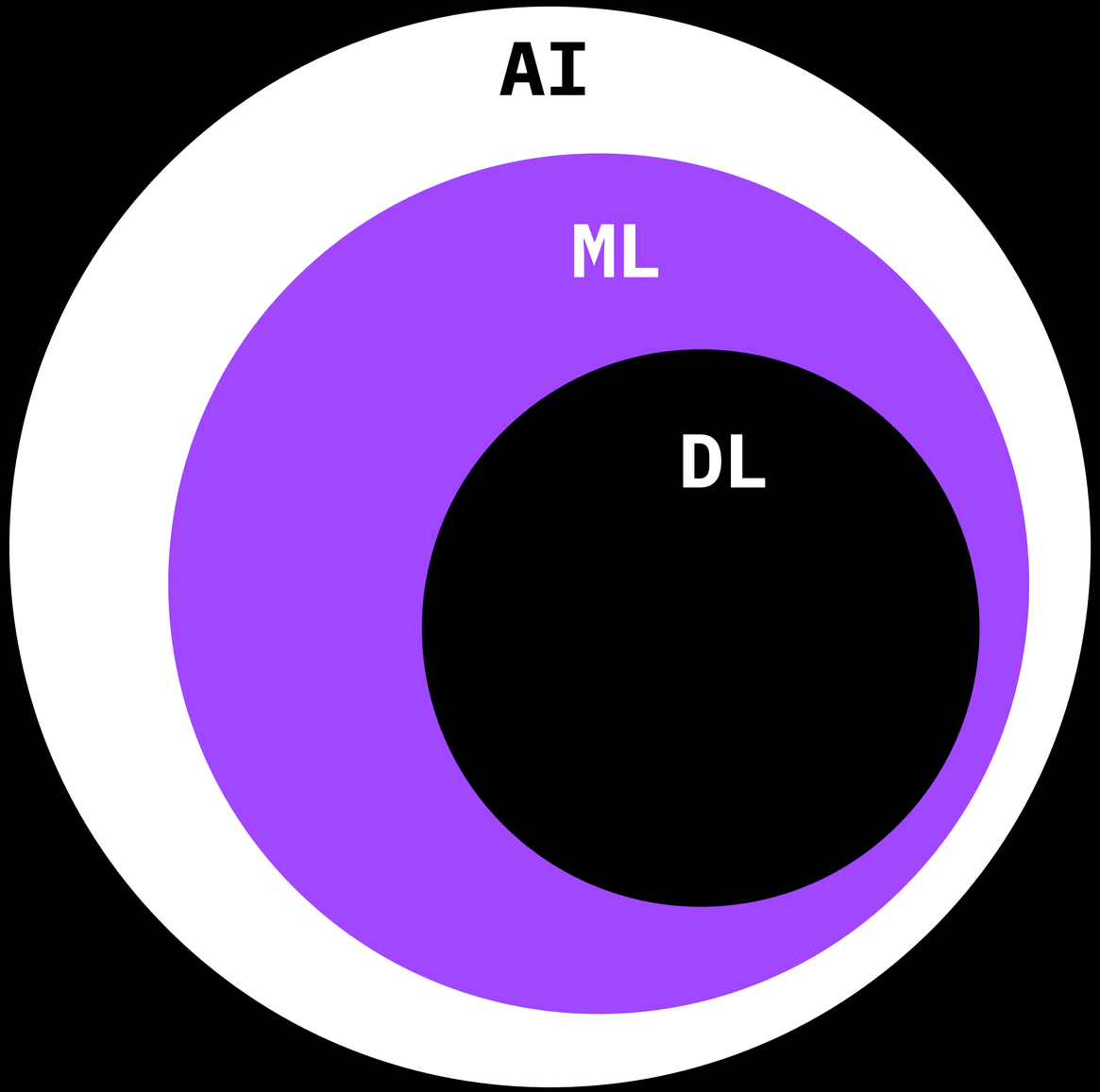
Art + Artificial Intelligence 2024


Hey Google, play us some music please?
Why are you being so polite?
Just in case.
KEEP THAT ONE ALIVE.
HE ALWAYS SAID "PLEASE".
seebangnow



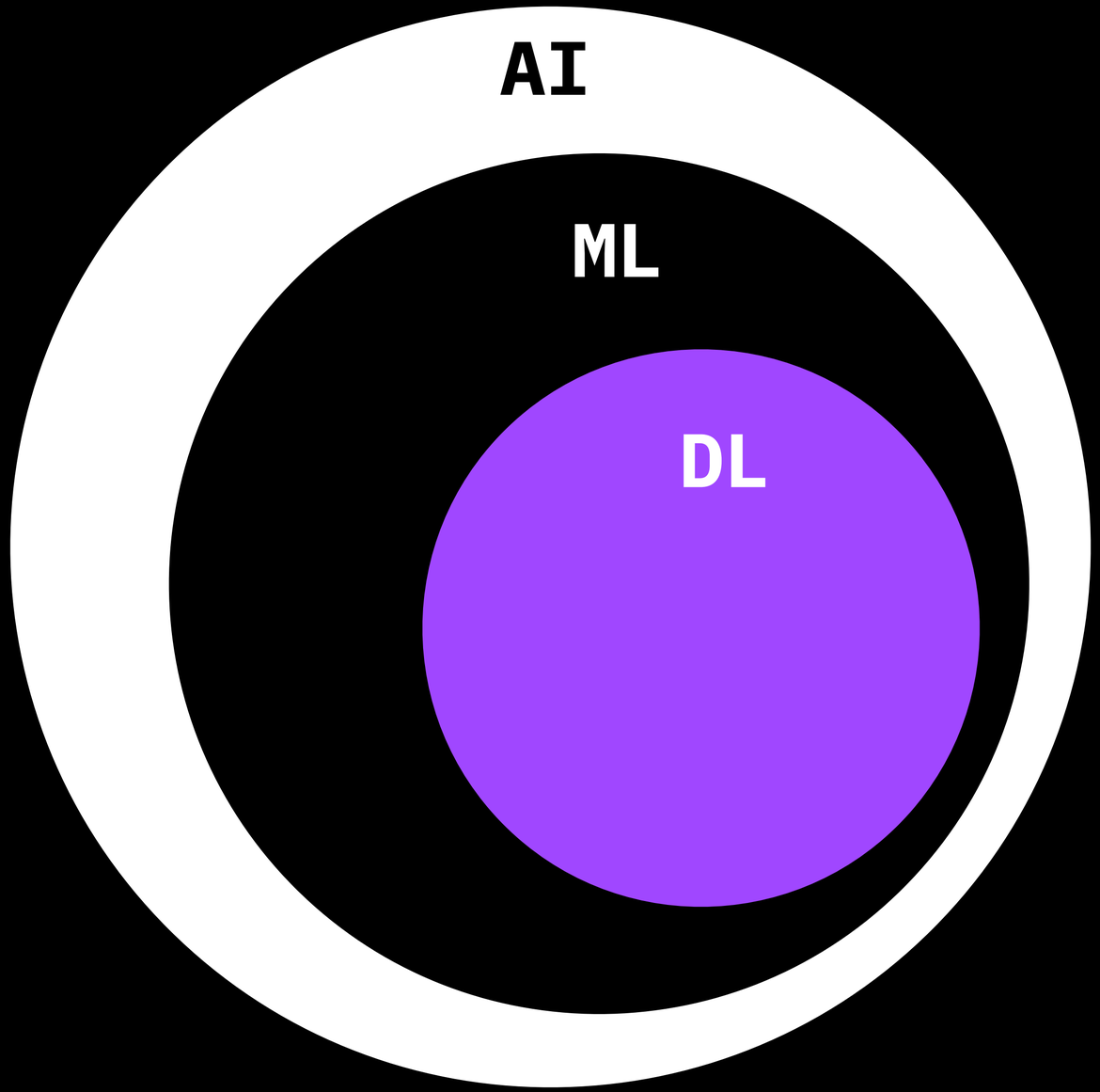
ARTIFICIAL INTELLIGENCE

A system that can perform one (or more) defined tasks as well as (or better) than a human.



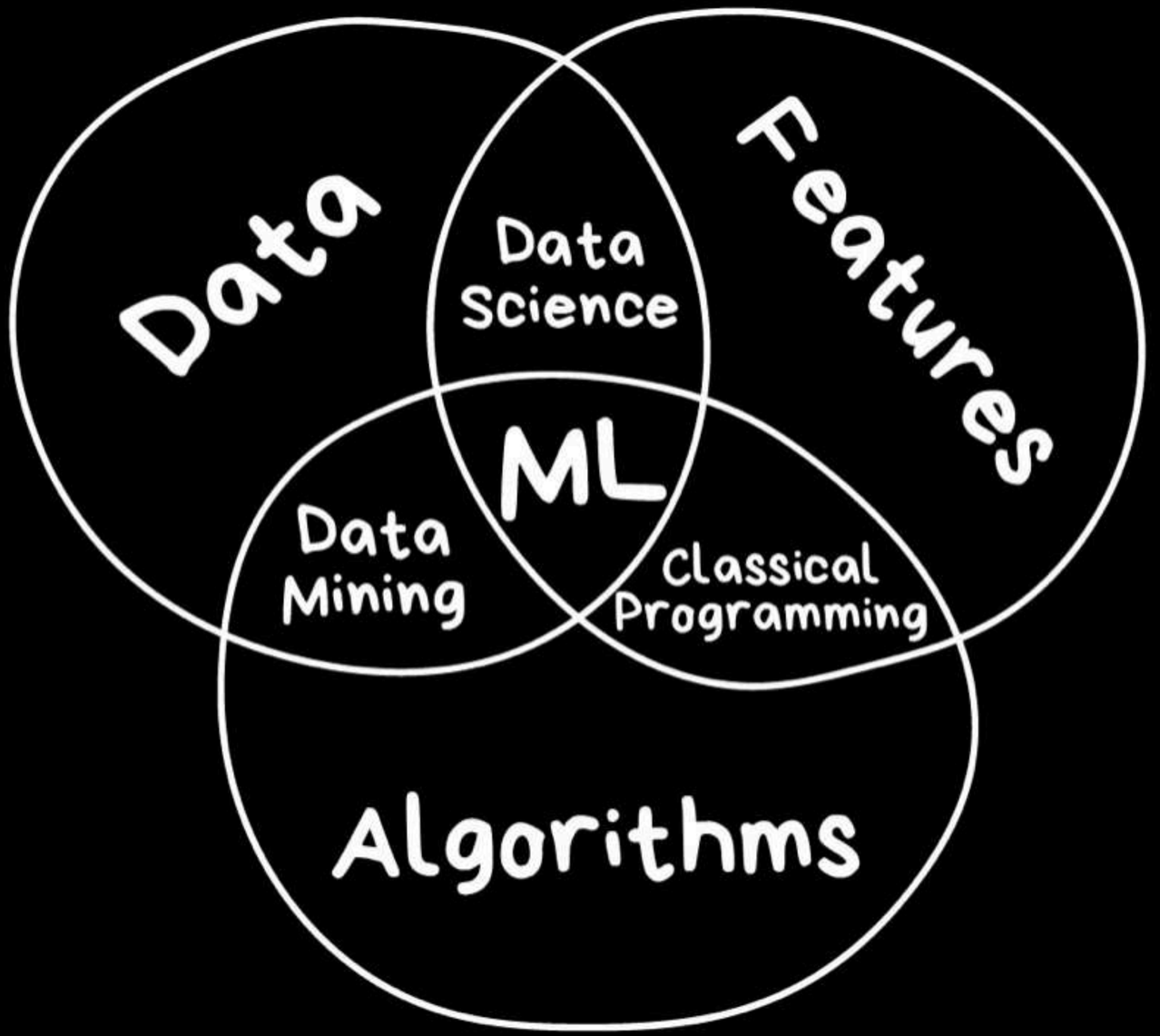
MACHINE LEARNING

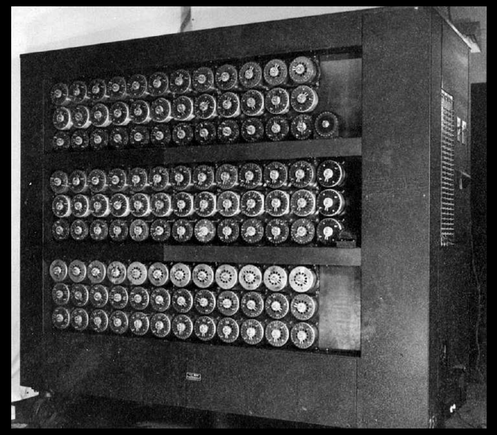
Adaptive systems capable of recognizing patterns and developing solutions based on existing data.



DEEP LEARNING

Implementation of machine learning where the structure is arranged in hidden layers that imitate the human brain.


Data
Features
Algorithms
Data Science
ML
Data Mining
Classical Programming

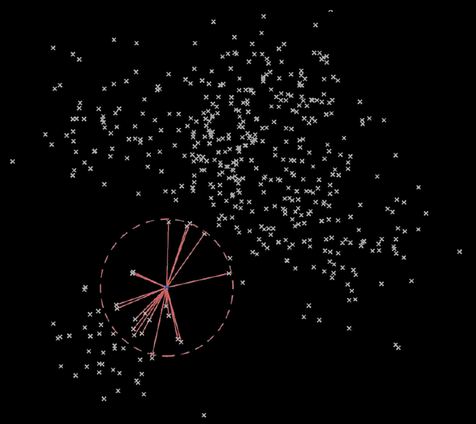


1950
Turing Test

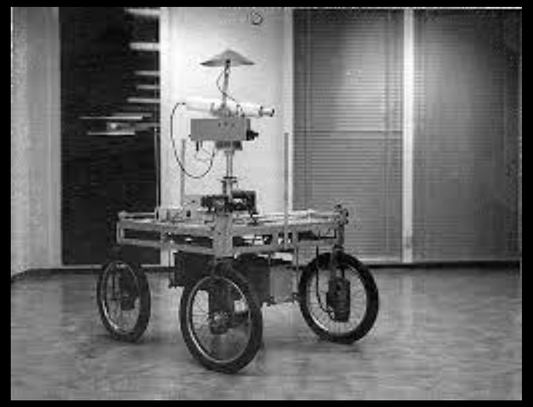
1956
MANIAC

1958
Perceptron
(Neuron)

1967
k-nächste-Nachbarn-Algorithmus

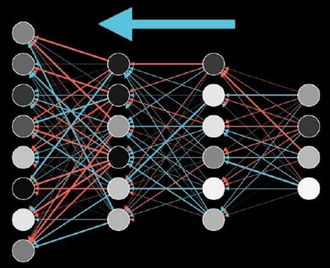


1974-1980
AI WINTER



1979
The
Stanford
Cart

1986
Multi-layered
Perceptron
(Backpropagation)



1996
IBM Deep Blue

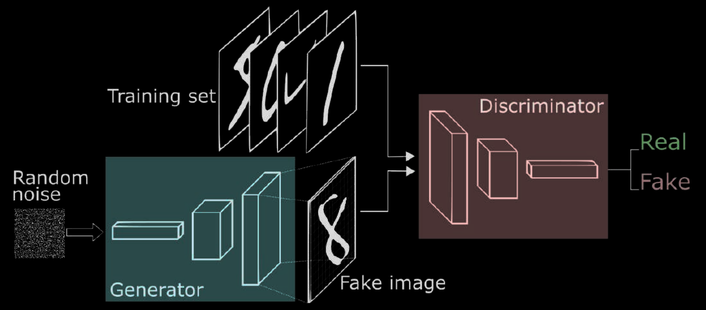
2002
Torch

torch

2006
Deep Learning

2011
IBM Watson

2012
AlexNet (ImageNet)



2014
GANs

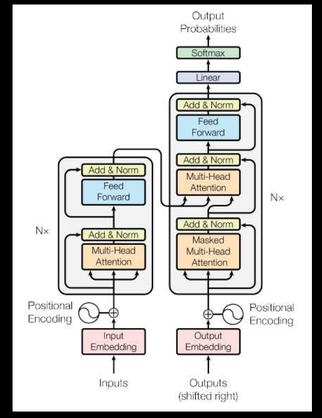
A Fast Learning Algorithm for Deep Belief Nets

Geoffrey E. Hinton
hinton@cs.toronto.edu
Simon Osindero
osindero@cs.toronto.edu
Department of Computer Science, University of Toronto, Toronto, Canada M5S 3G4

2016
DeepMind AlphaGo

2017
Deepfake

2018
Attention Is All You Need



2020
DeepMind
Alphafold

2022
Dalle-2
Midjourney
Stable Diffusion

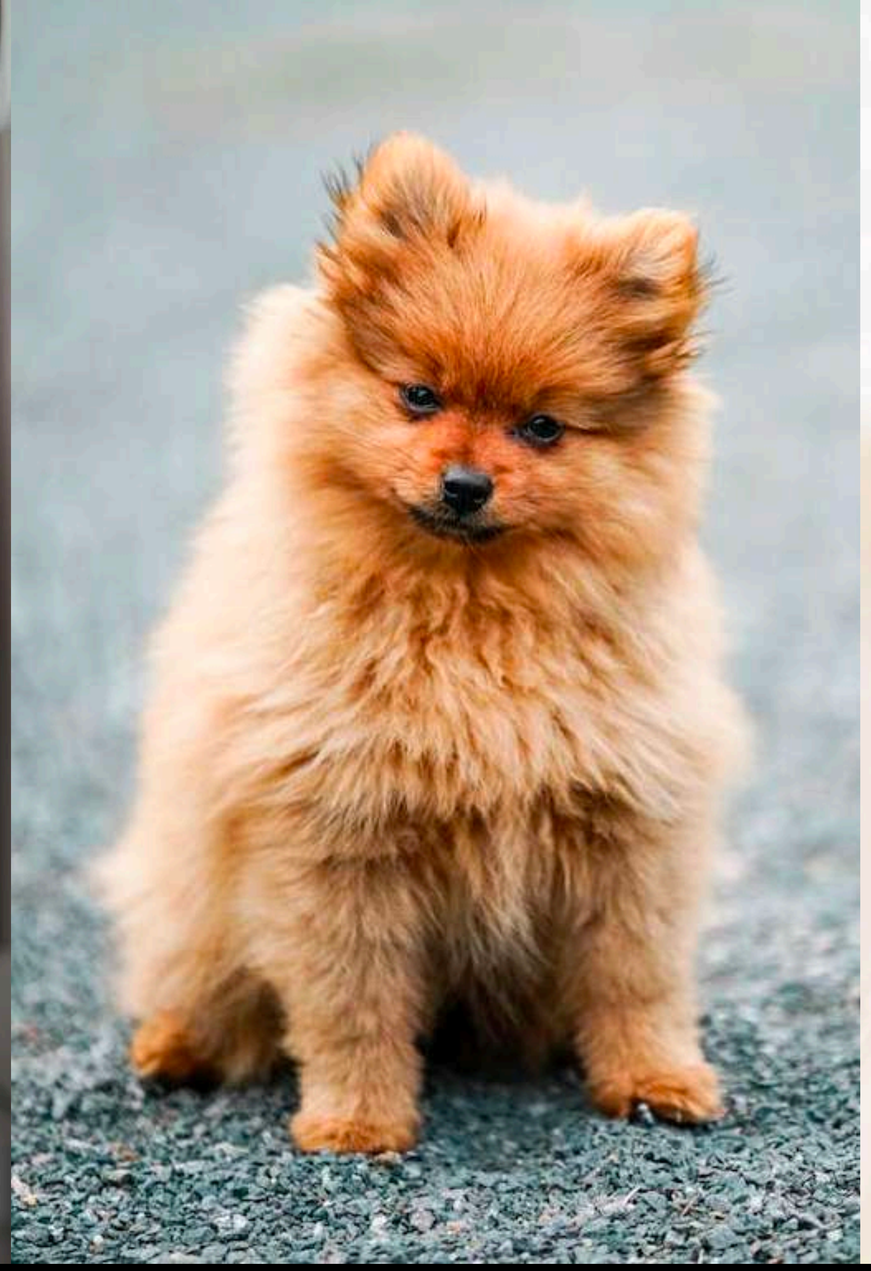
2023
OpenAI GPT-4
Claude
Perplexity AI

What would happen if the strings were cut?

The balloons would fly away.

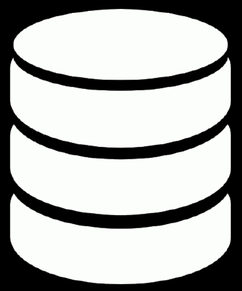
2024
SORA

2024
GPT-4o

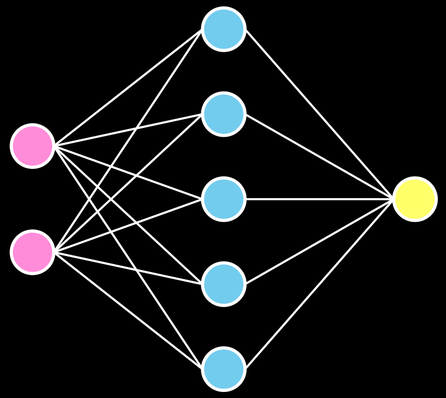




How would you explain the difference between a dog and a cat to someone?

Machine Learning

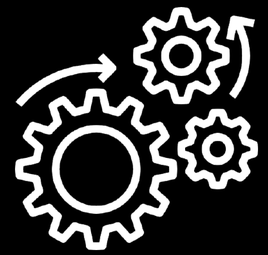


Data

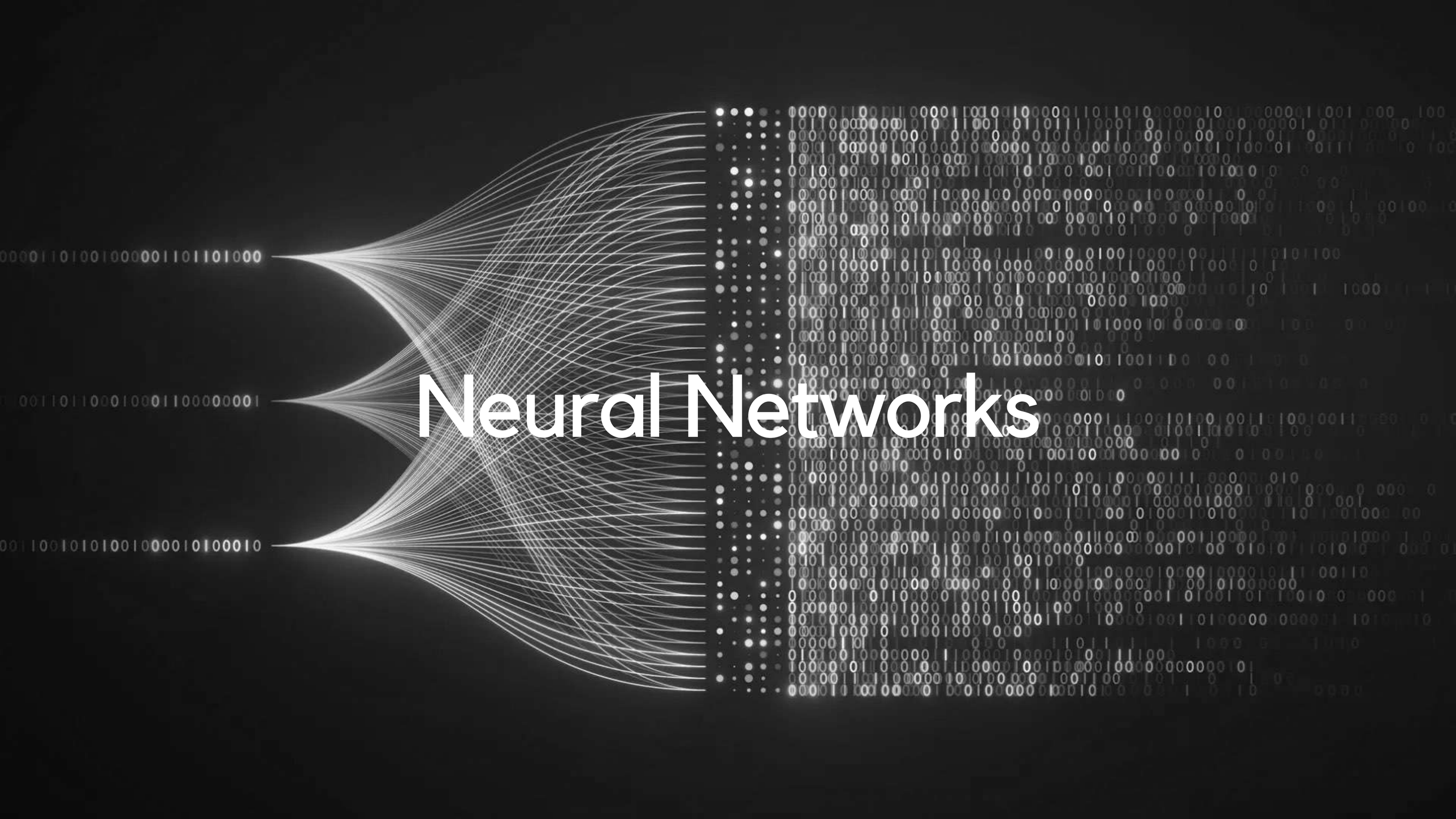


Model

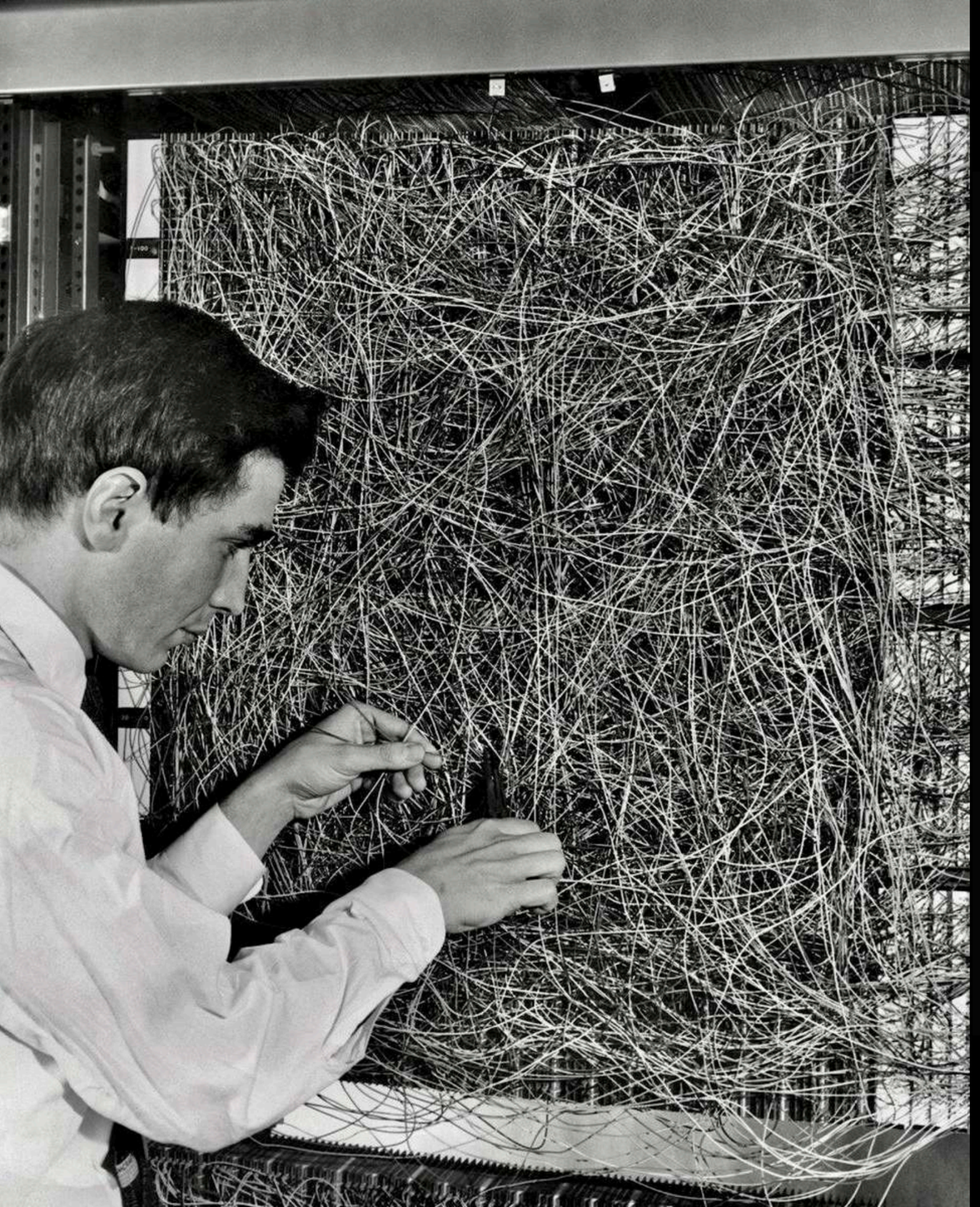
Evaluation Function



Training Process


Neural Networks

Source: Wikipedia



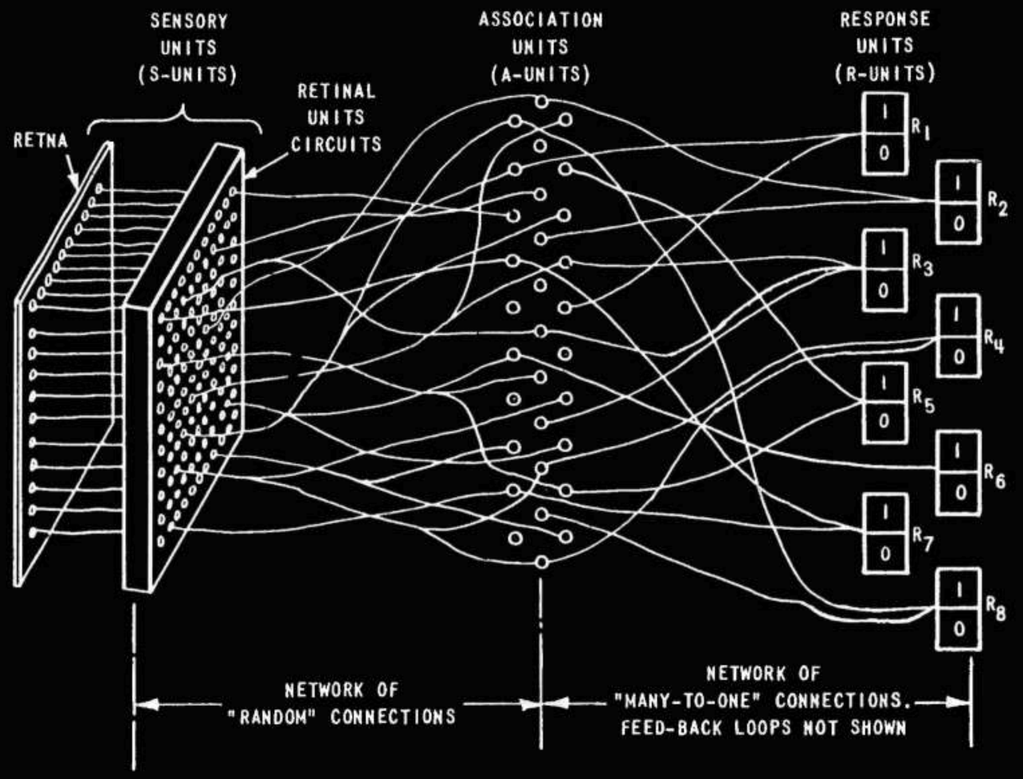
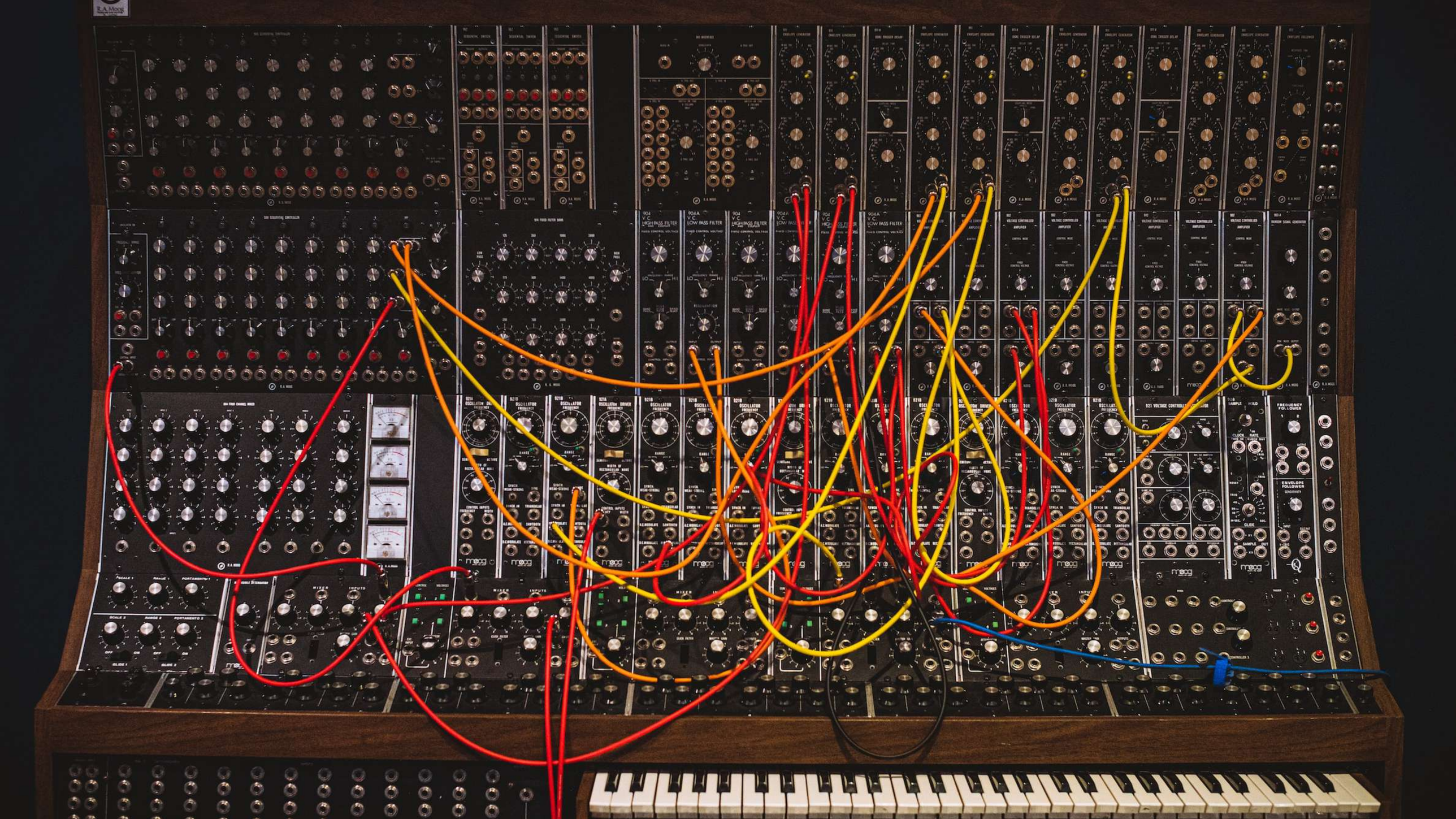
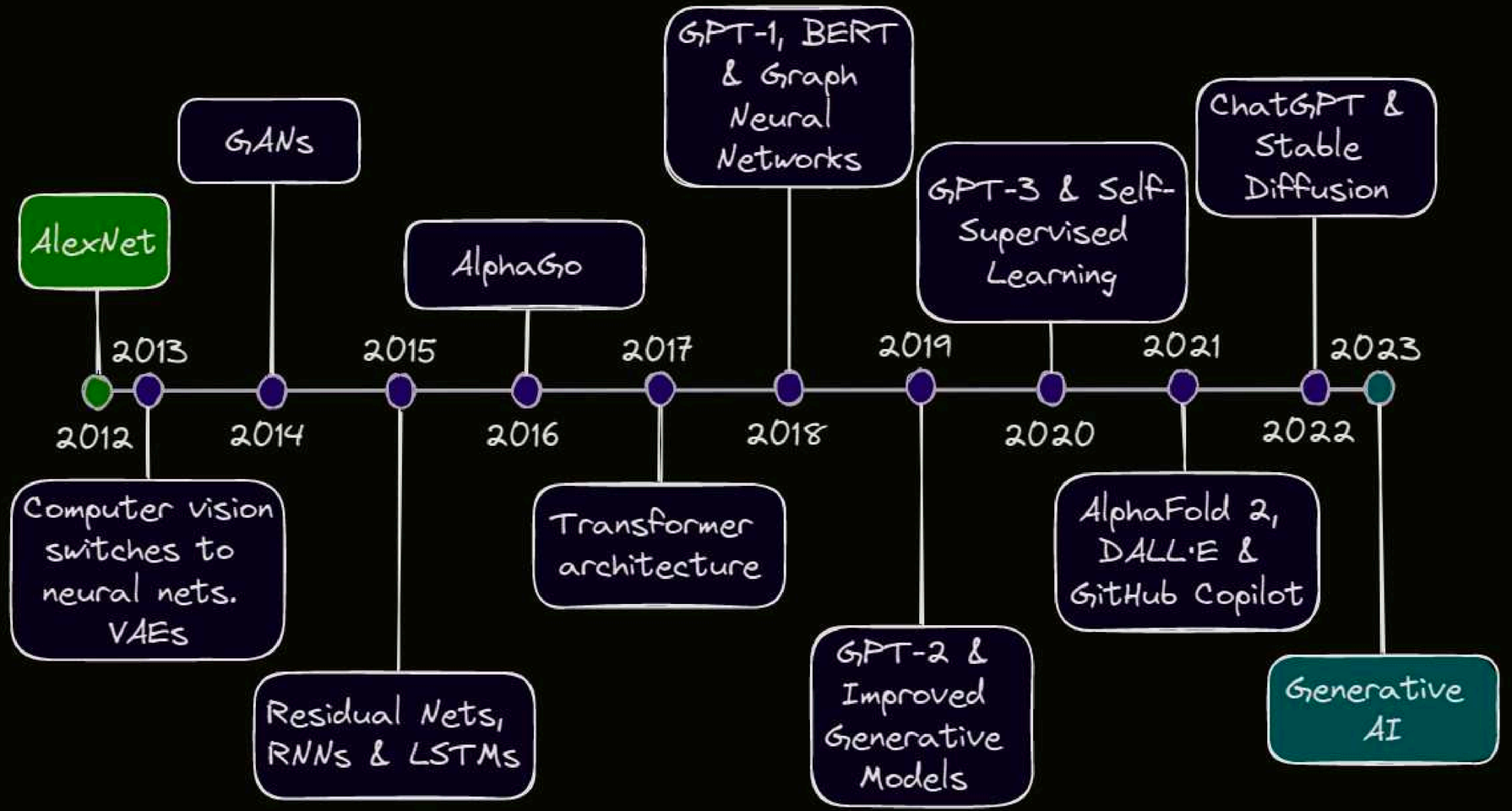


Figure 1 ORGANIZATION OF THE MARK I PERCEPTRON

Source: Reddit


R.A. Moog
904A V.C. LOW PASS FILTER
904A V.C. HIGH PASS FILTER
921B OSCILLATOR
921 VOLTAGE CONTROLLED OSCILLATOR
ENVELOPE FOLLOWER
moog

History of Neural Networks



Source: Thomas A Dorfer

Learning Process

Input Layer

Color

Age

Fur

x_1

x_2

x_3

Weights

Hidden Layer

h_1

h_2

h_3

h_4

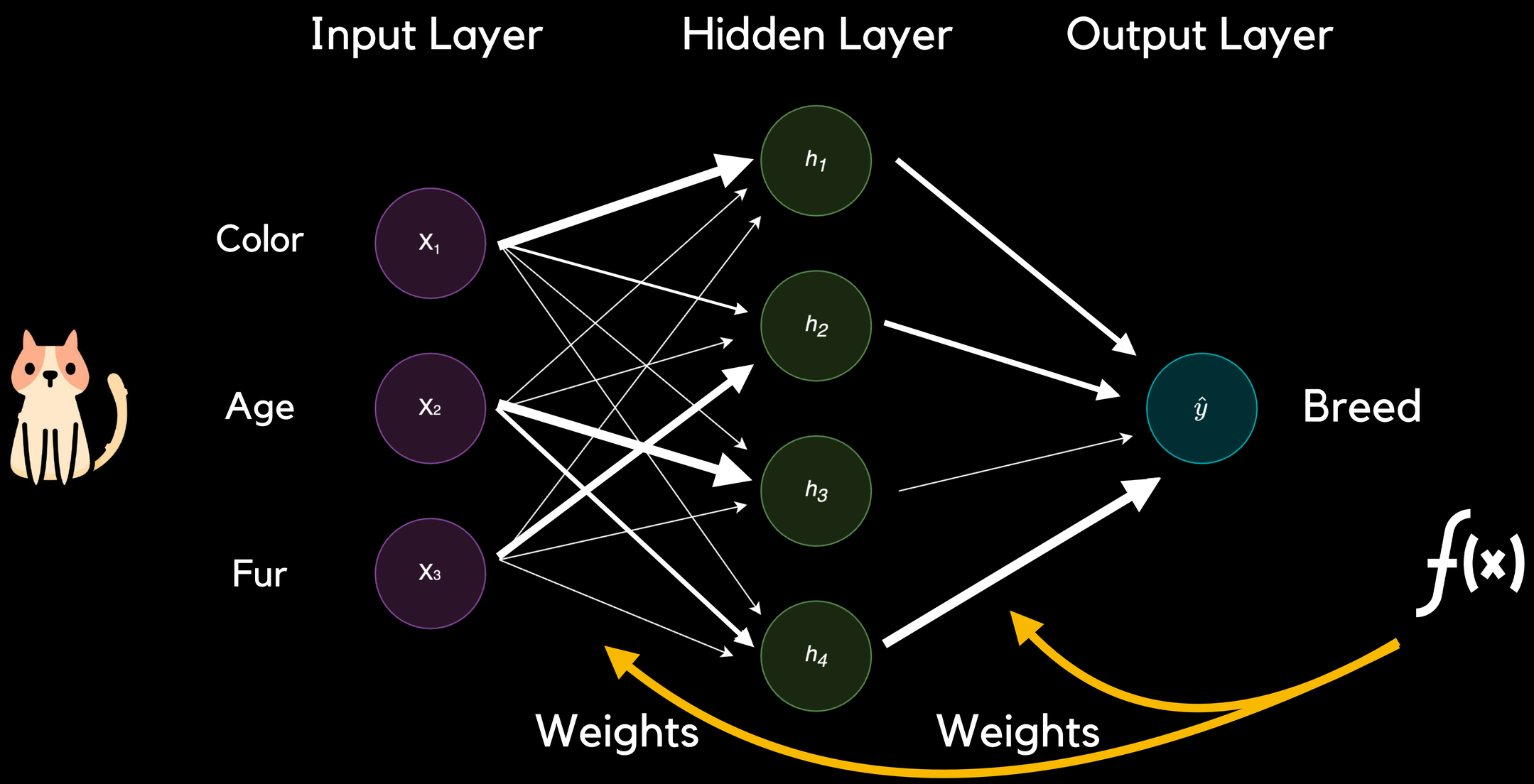
Weights

Output Layer

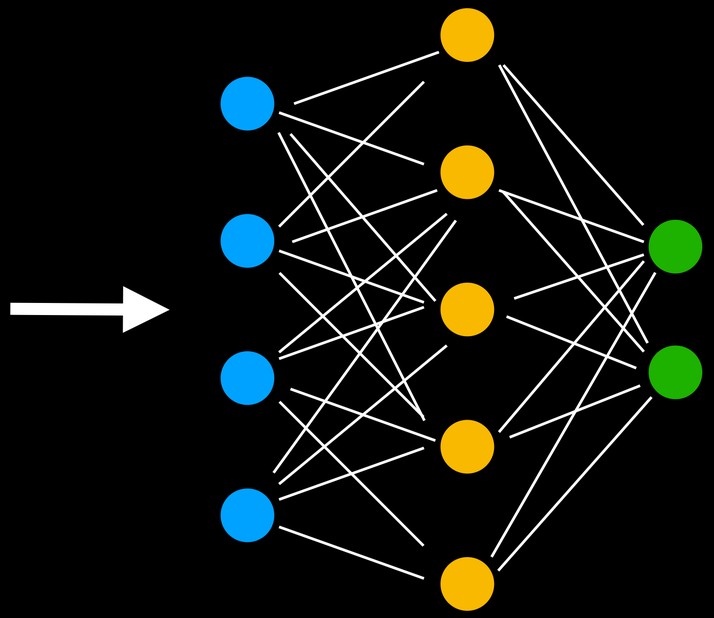
$\hat{y}$

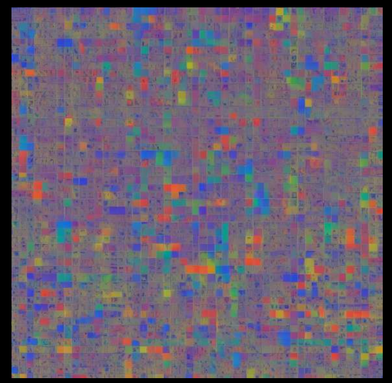
Breed

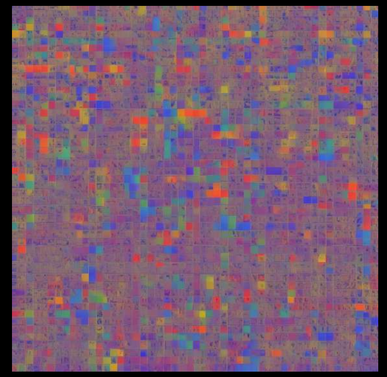
Learning Process



Neural Network





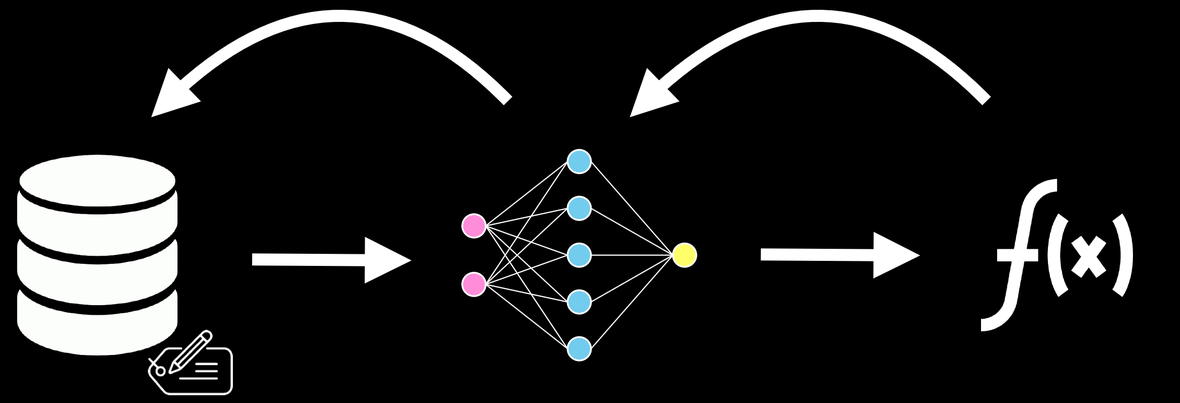


Data

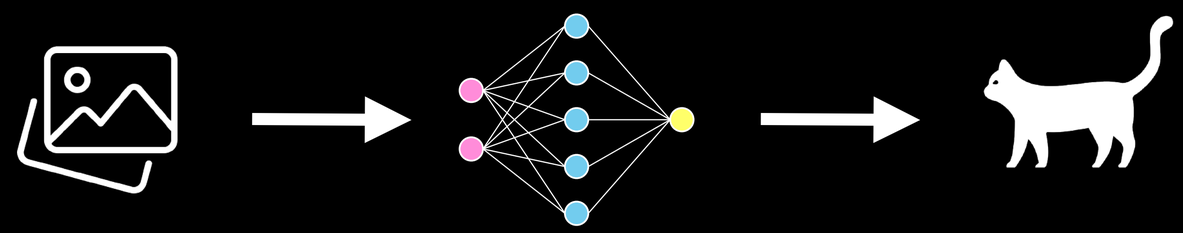
Model

Weights

Lifecycle



Training

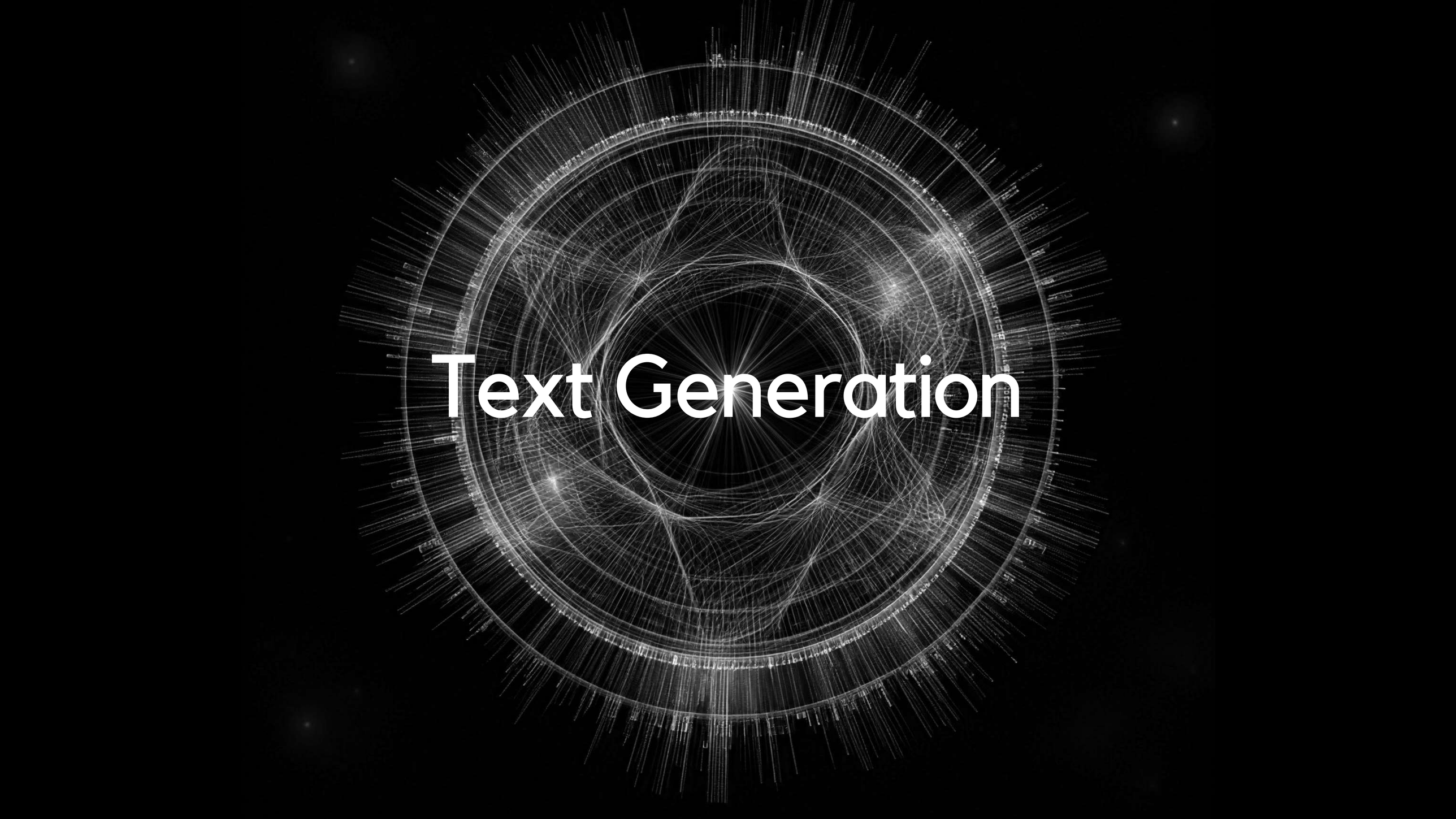


Inference / Prediction

Lifecycle

Train

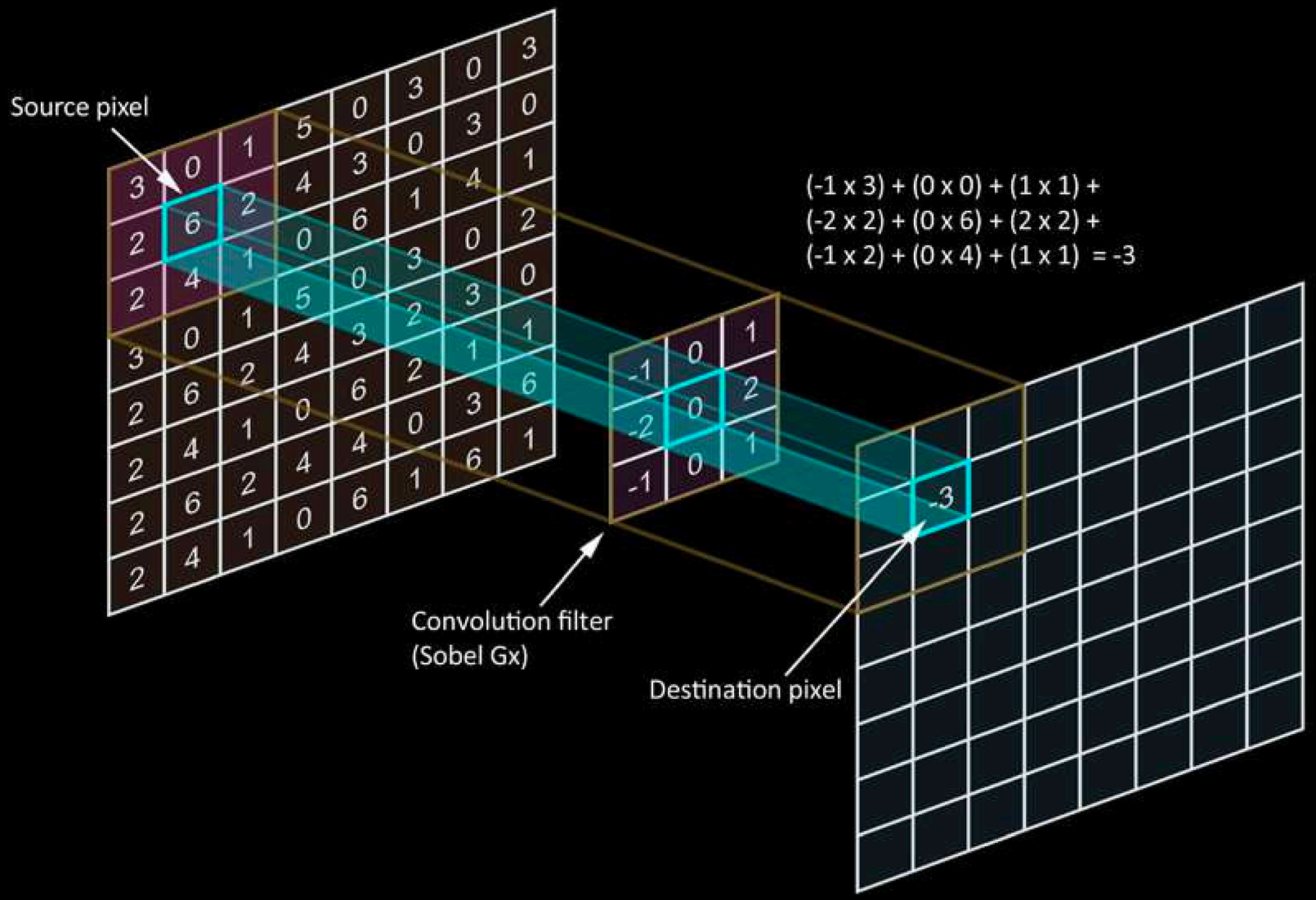
Source: The Book of Shaders


Text Generation

Convolution

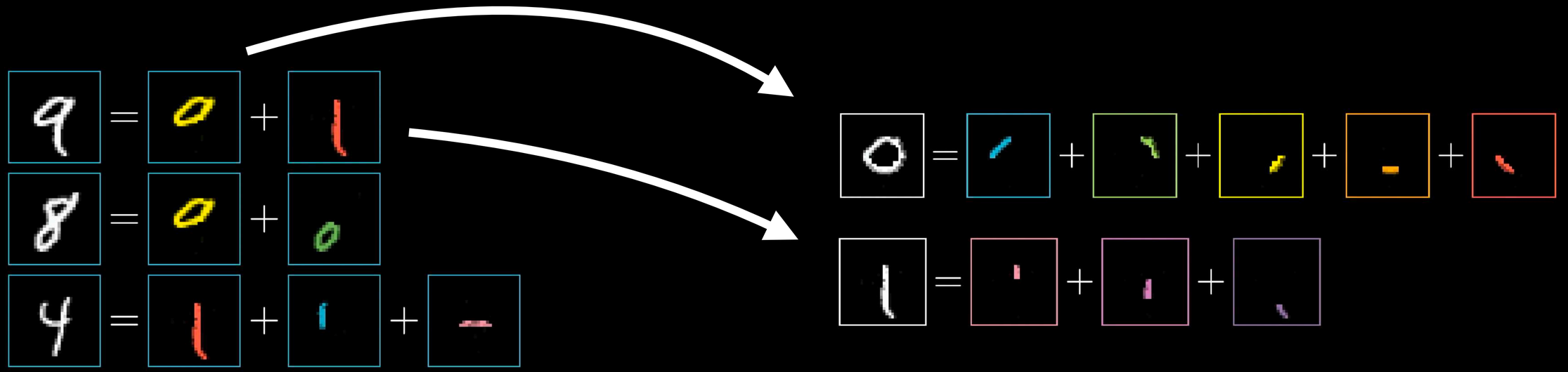
Source: 3blue1brown

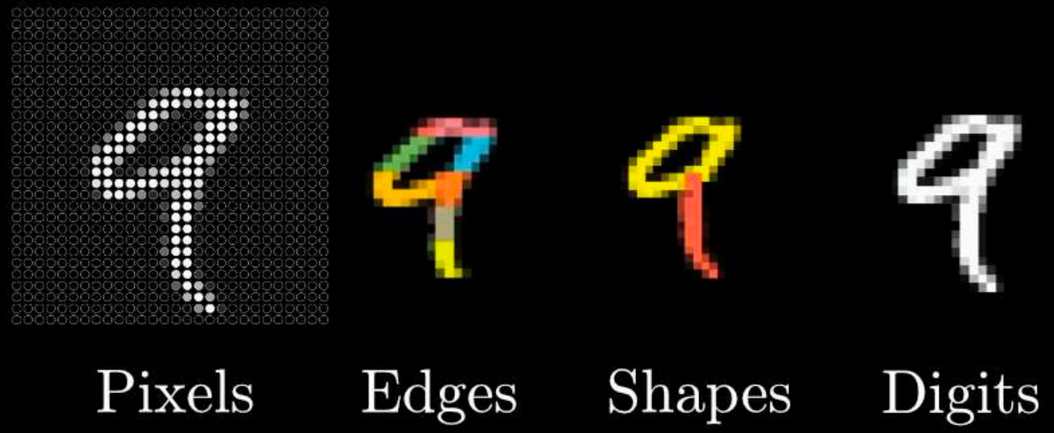
Convolution



Source: rohanverma

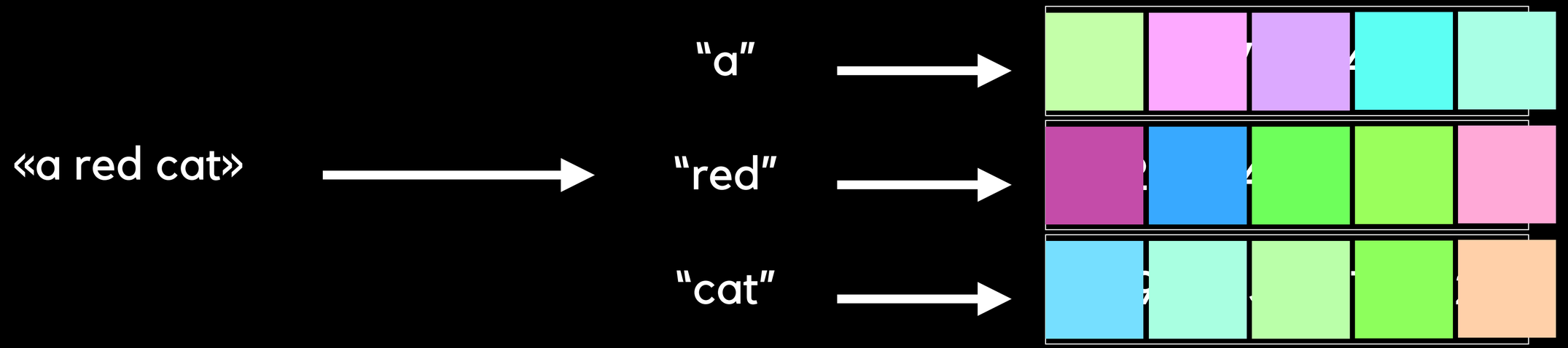
Convolution





Source: 3blue1brown

Word Embedding

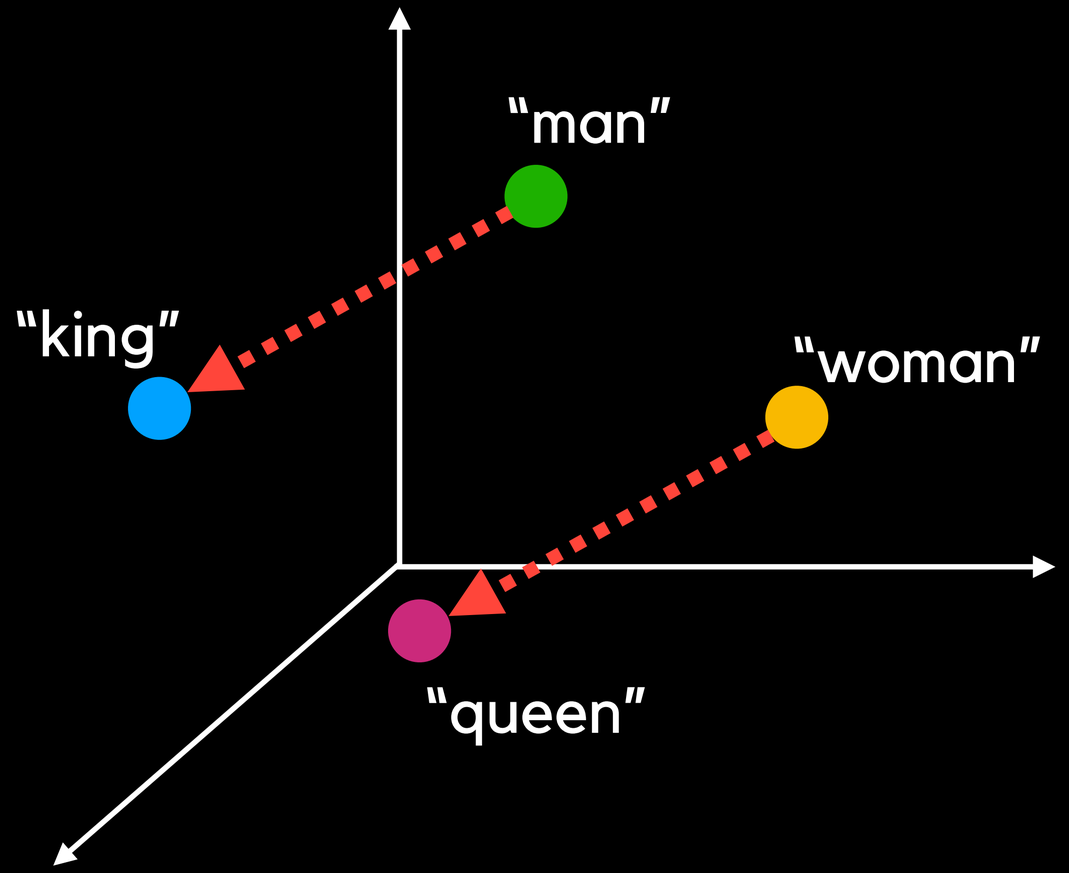


Input Sentence

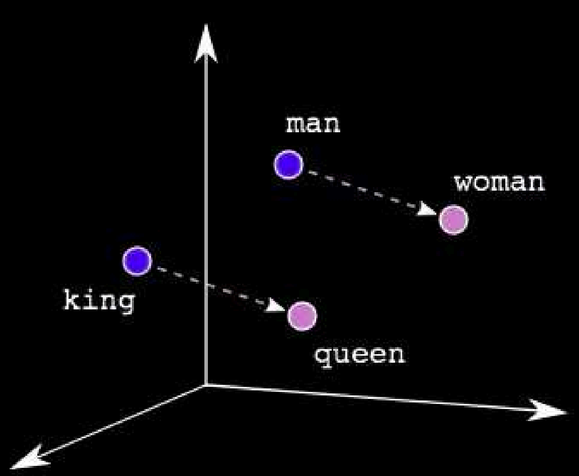
Tokens

Embeddings

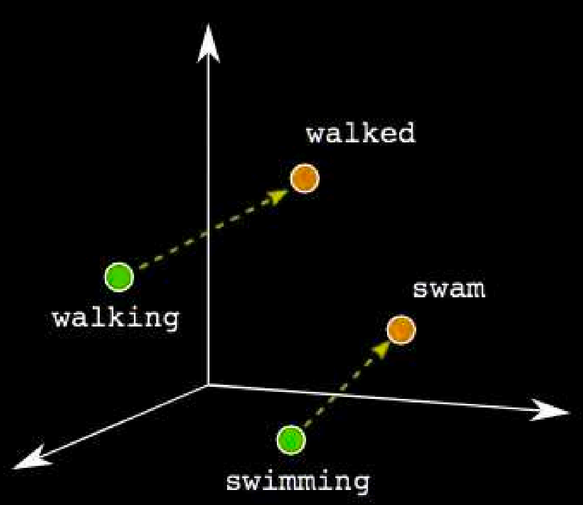
Word Embedding



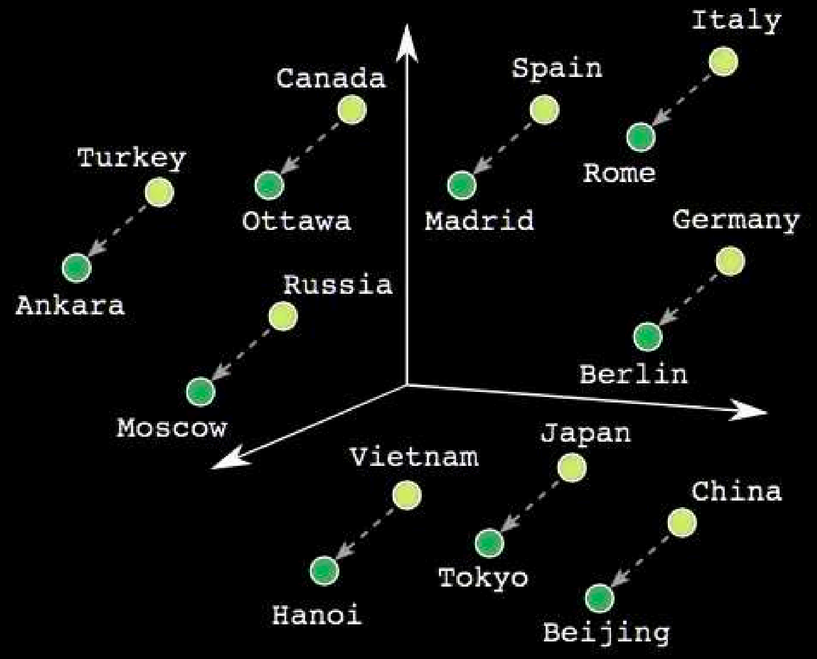
Word Embedding



Male-Female



Verb Tense

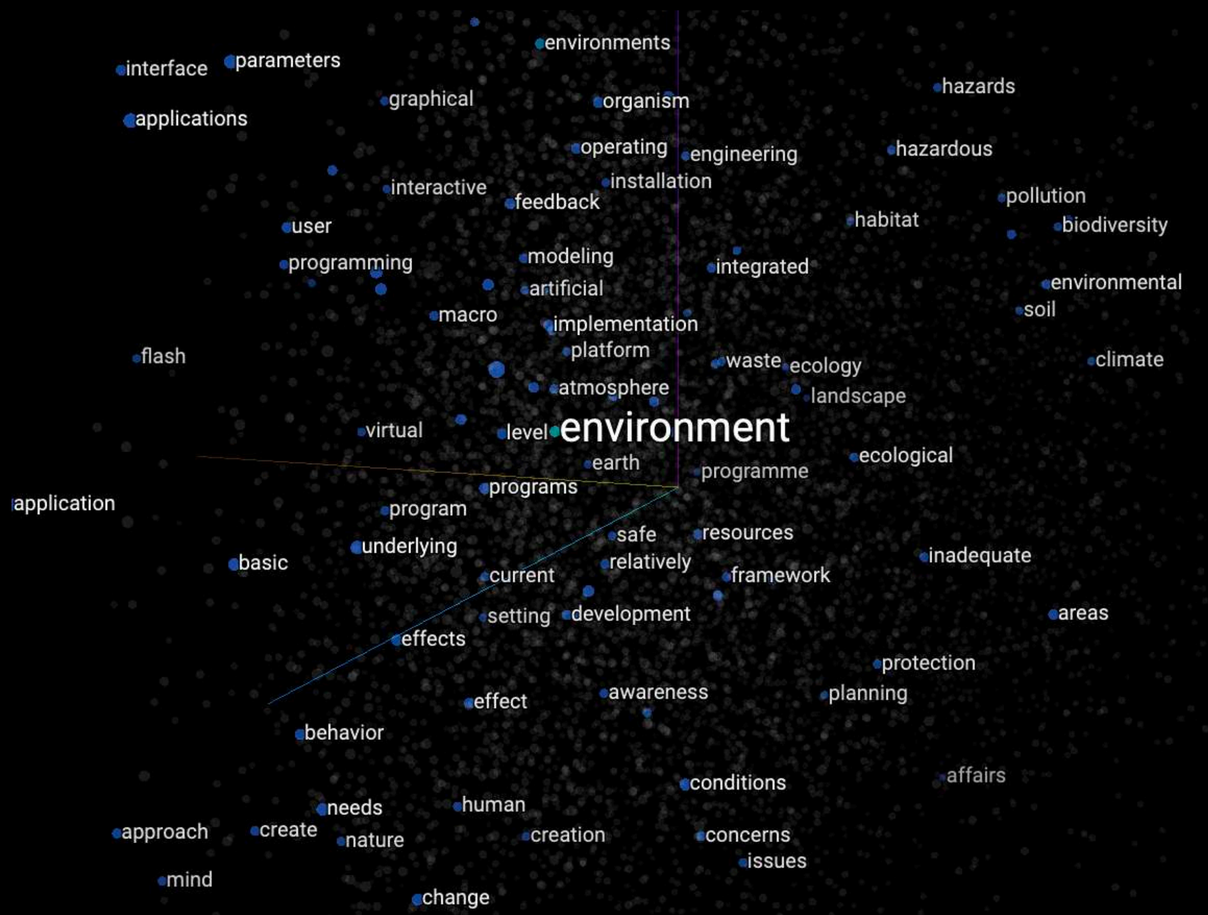


Country-Capital

Source: Google

Exercise

1. Go to Projector Tensorflow
2. Type in words and find similarities.
3. Note unusual connections.

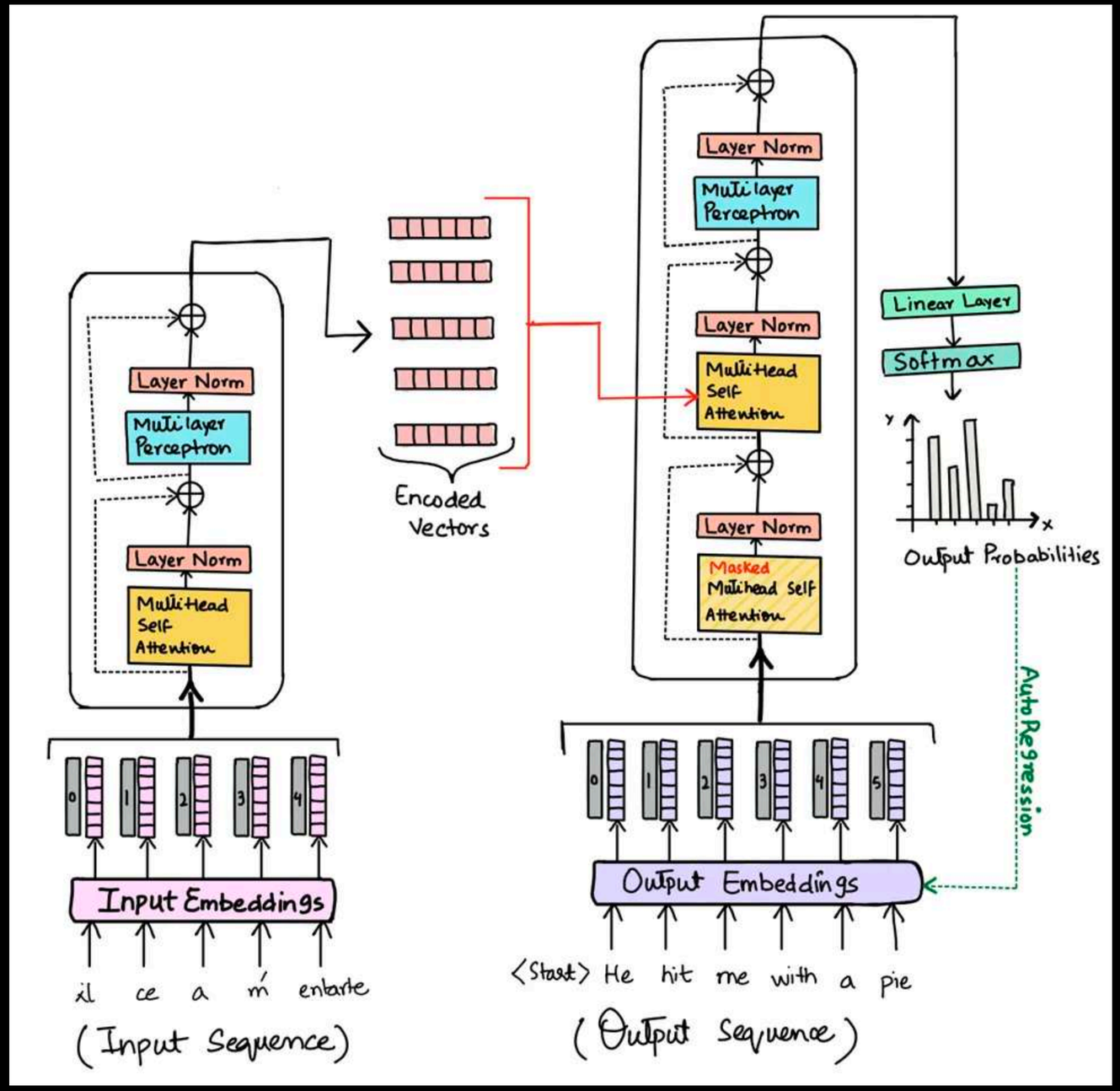


Transformer

low attention

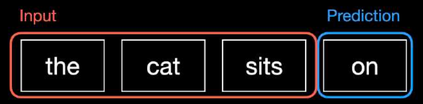
«She is eating a green apple»

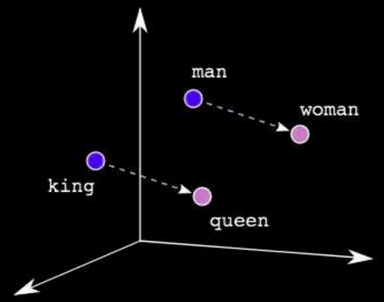
high attention

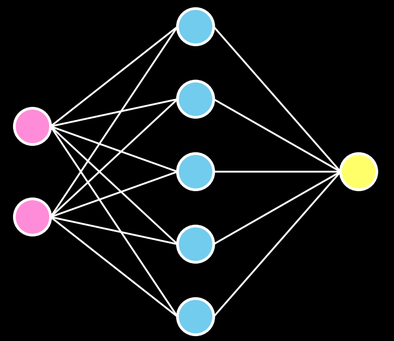


Source: Medium

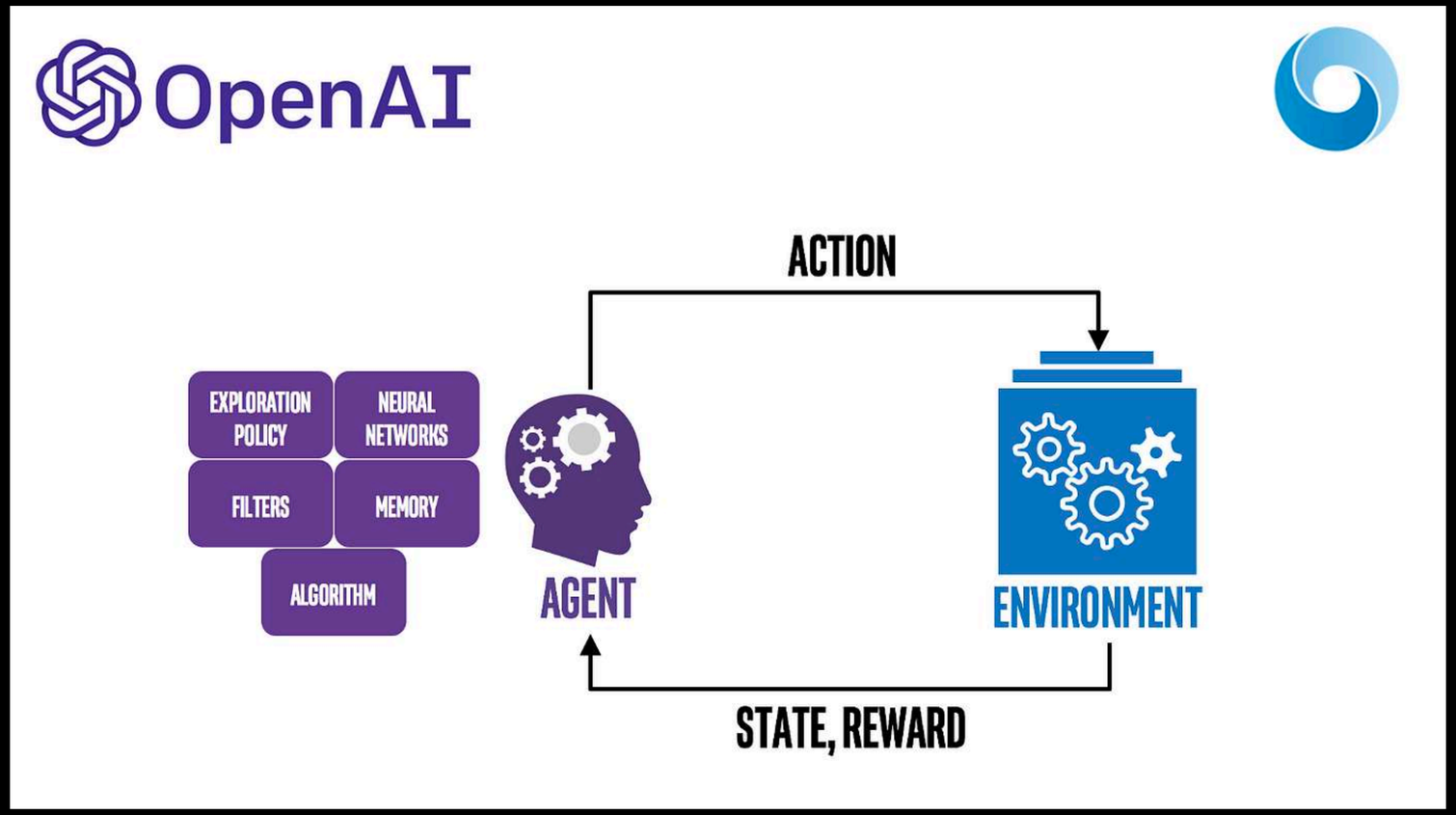
Generative **G** Pre-**P**ained **T** Transformer





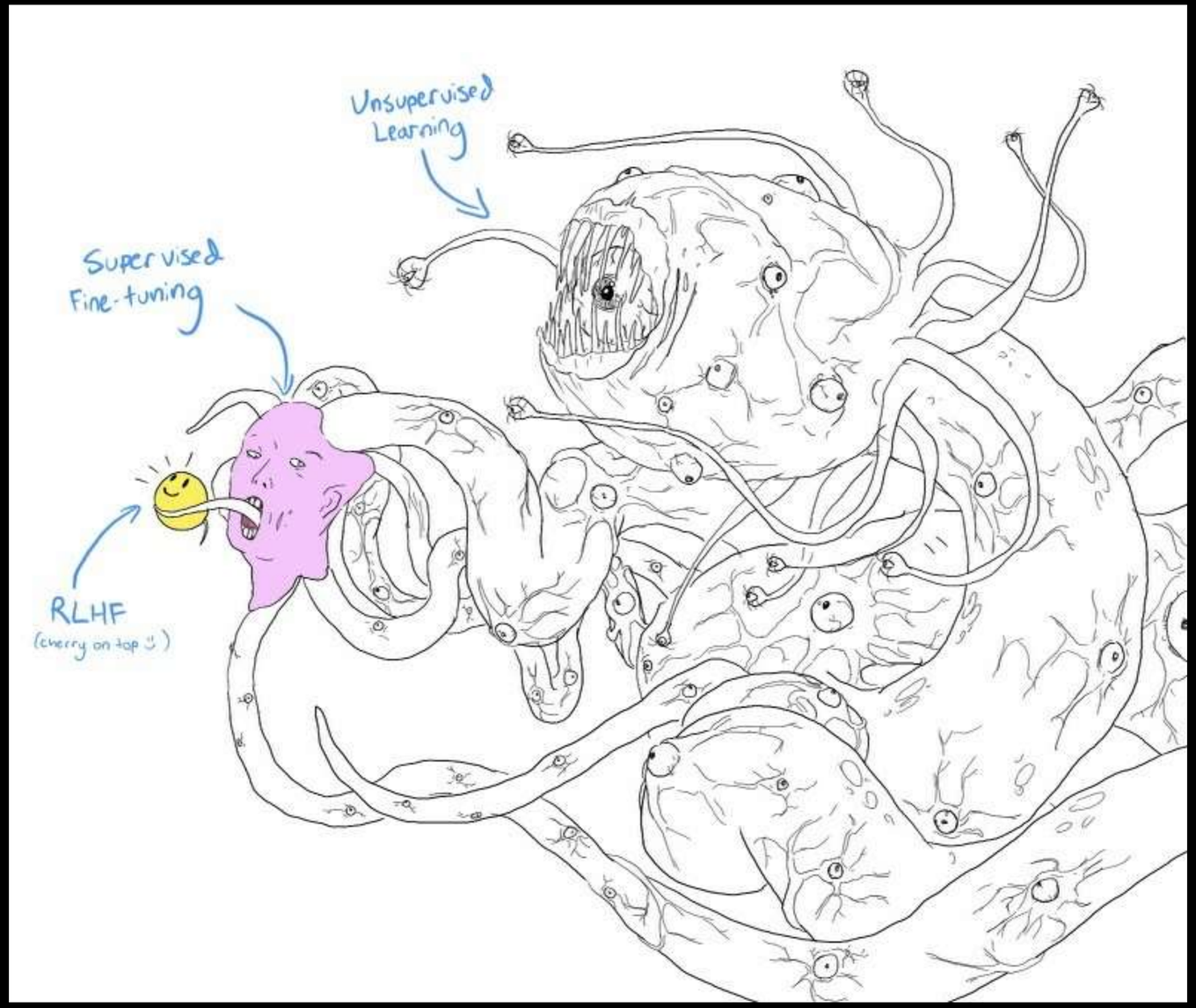


RLHF



Reinforcement Learning from Human Feedback (RLHF) is a method where algorithms learn to make decisions by receiving **input from humans.**

RLHF



twitter.com/anthrupad

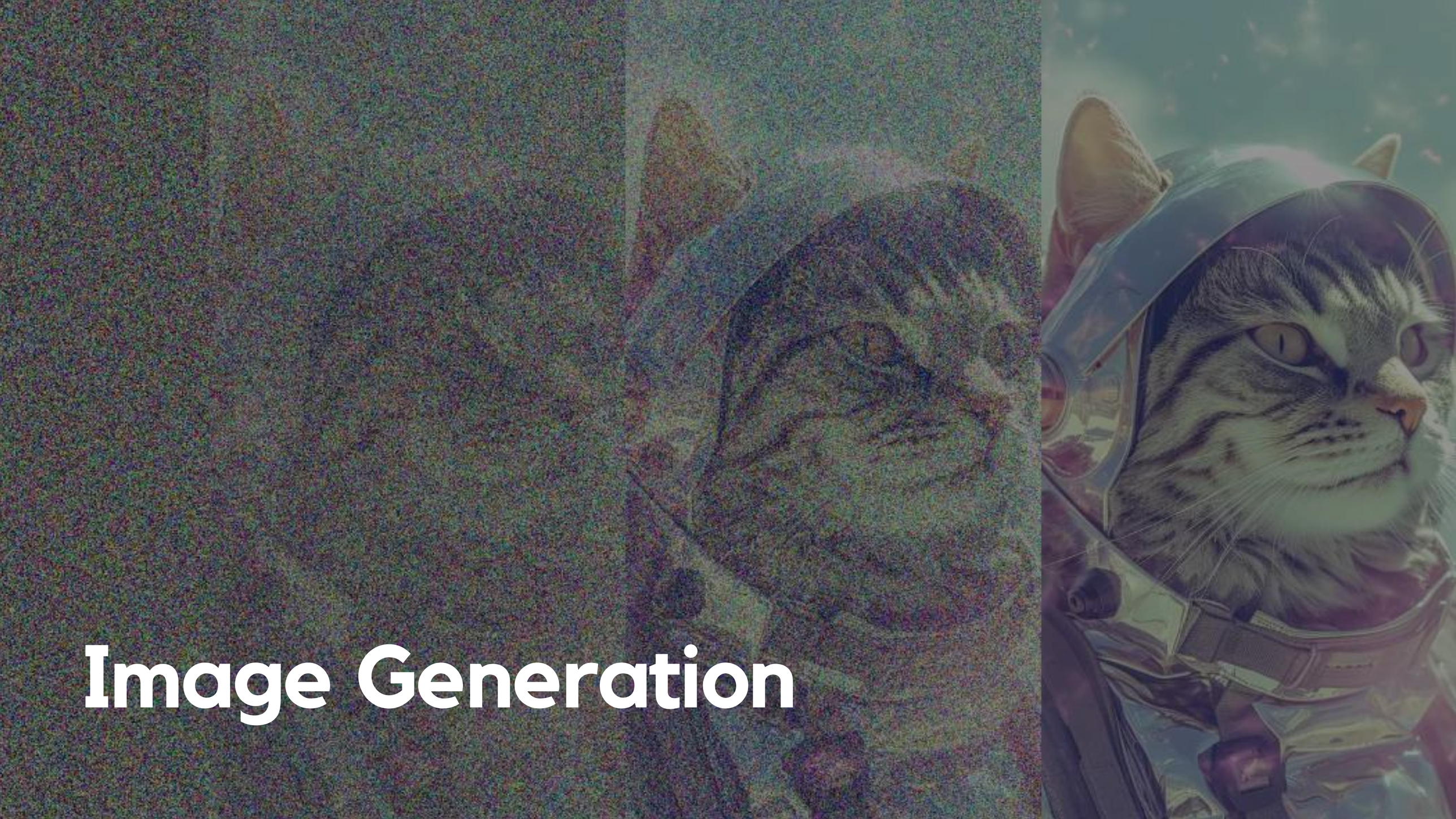
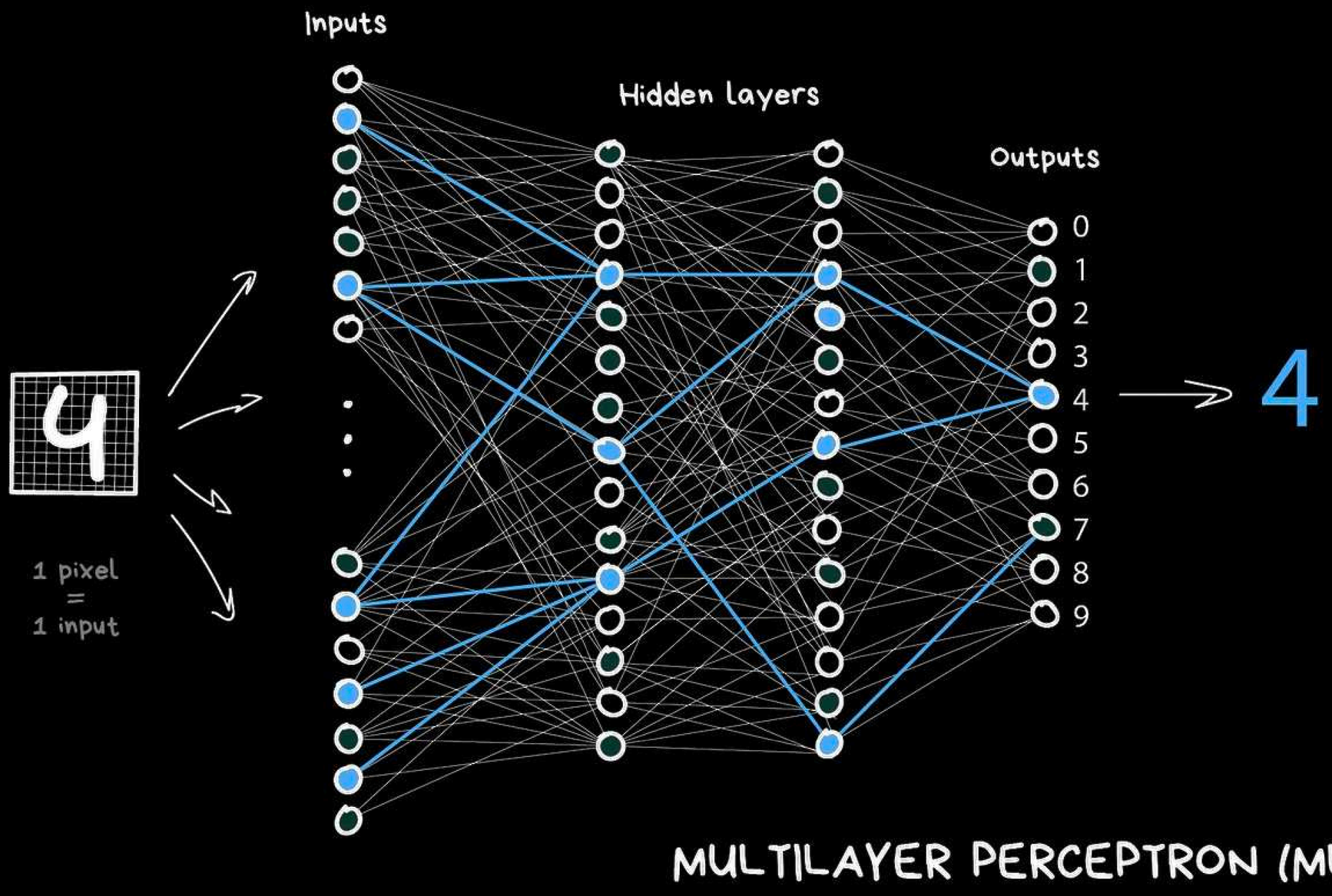
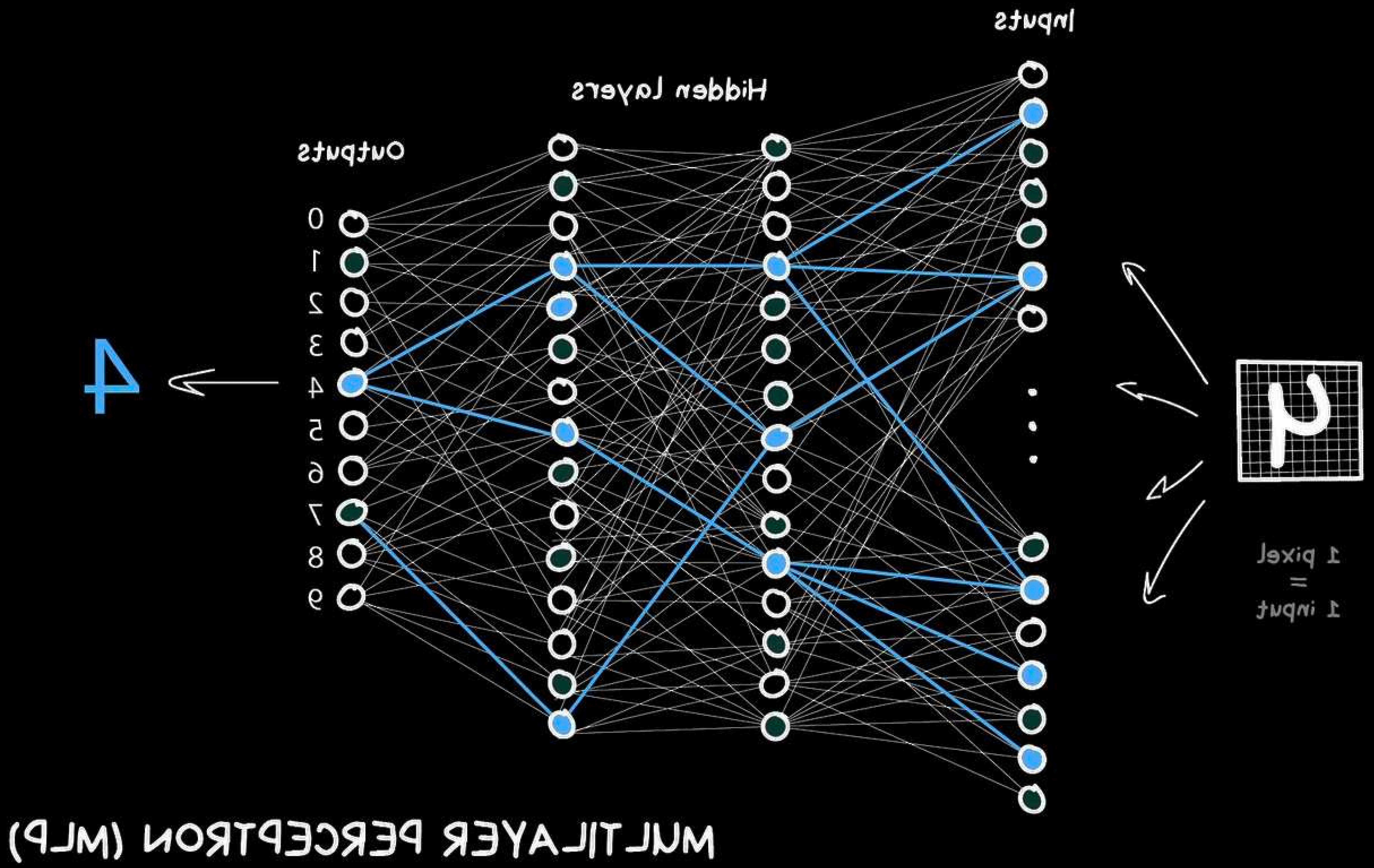


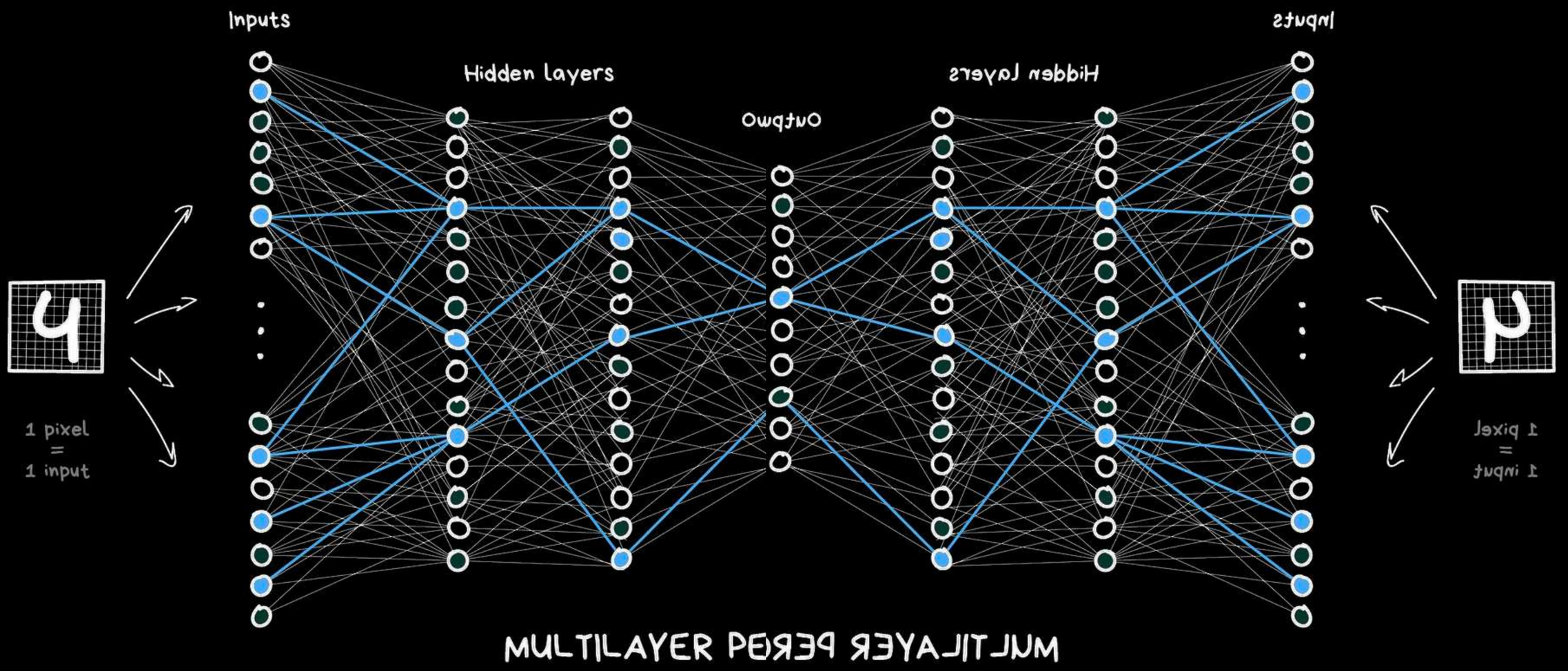
Image Generation



Source: Noelia González

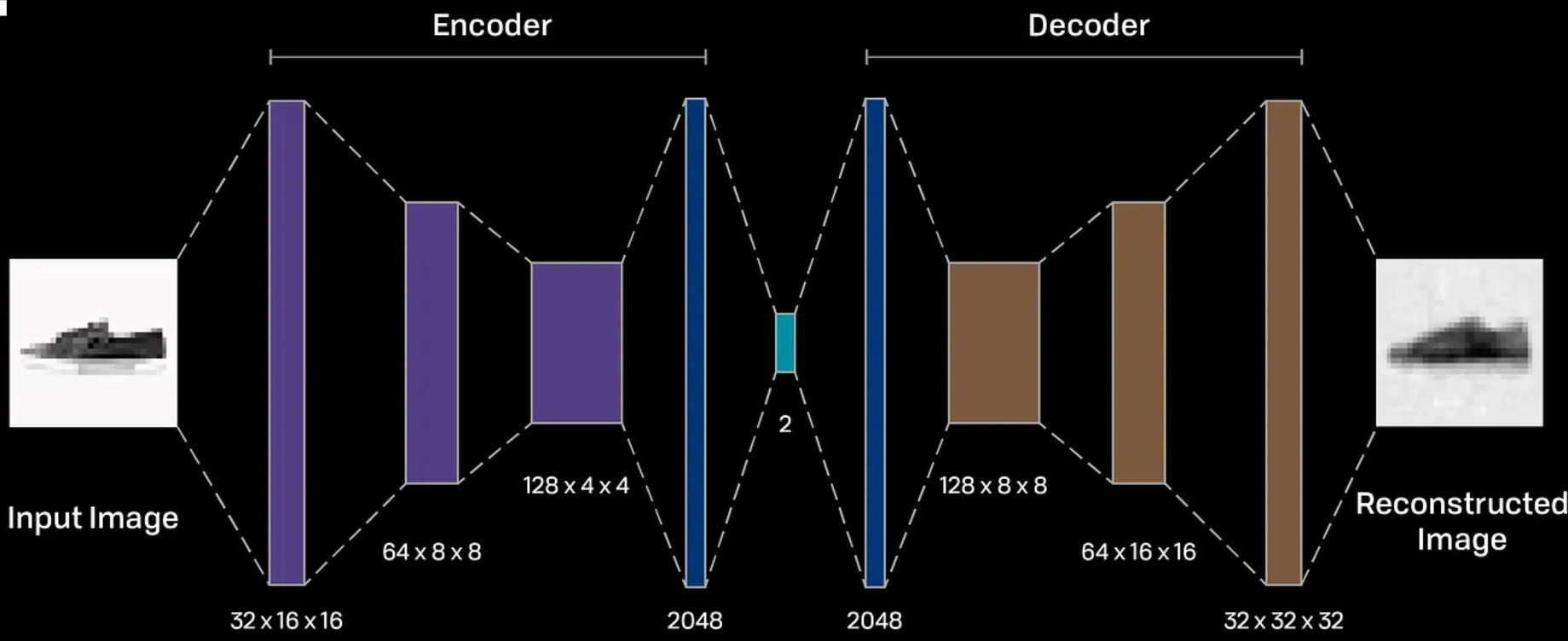


Source: Noelia González



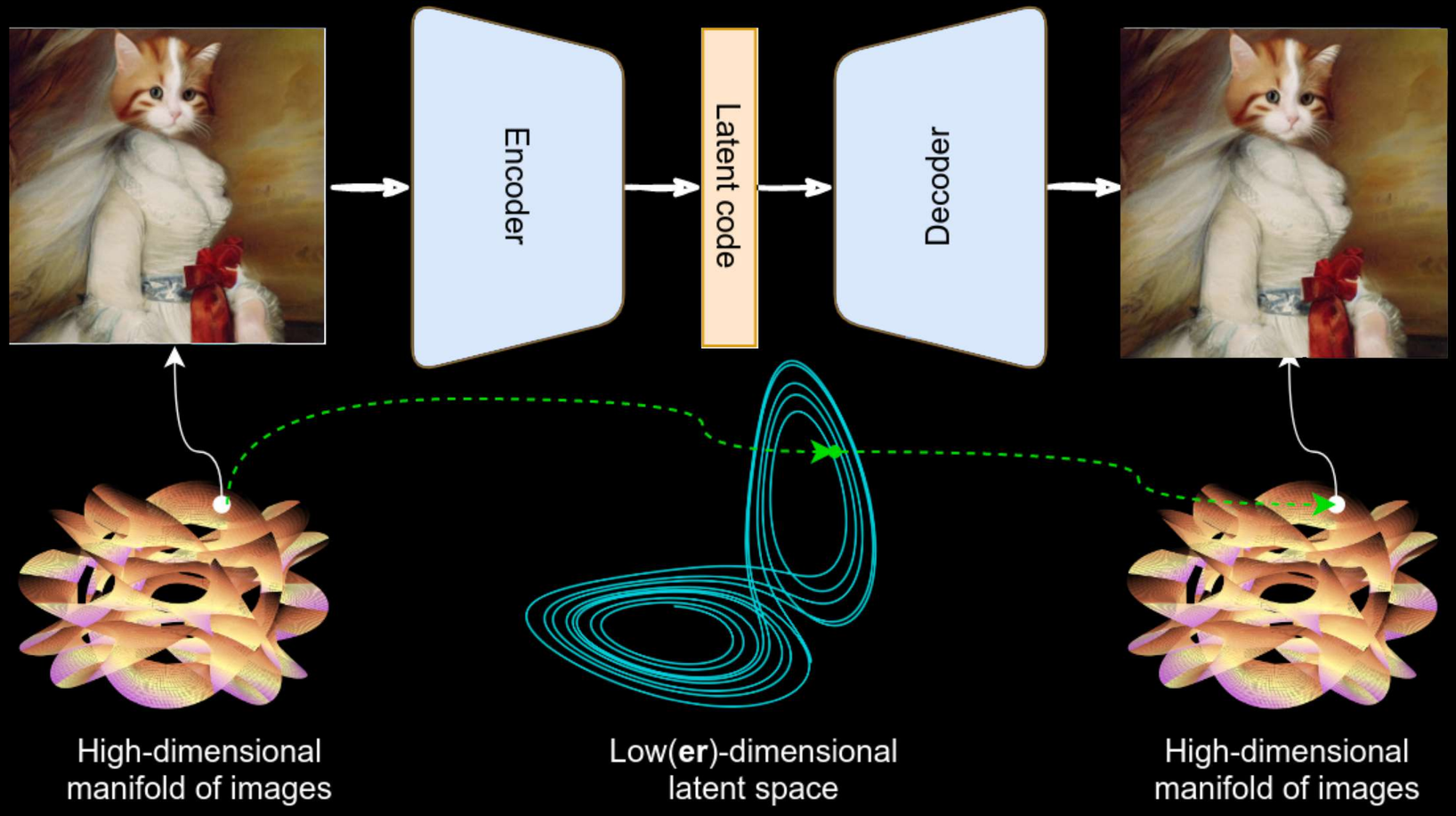
Source: Noelia González

VAE



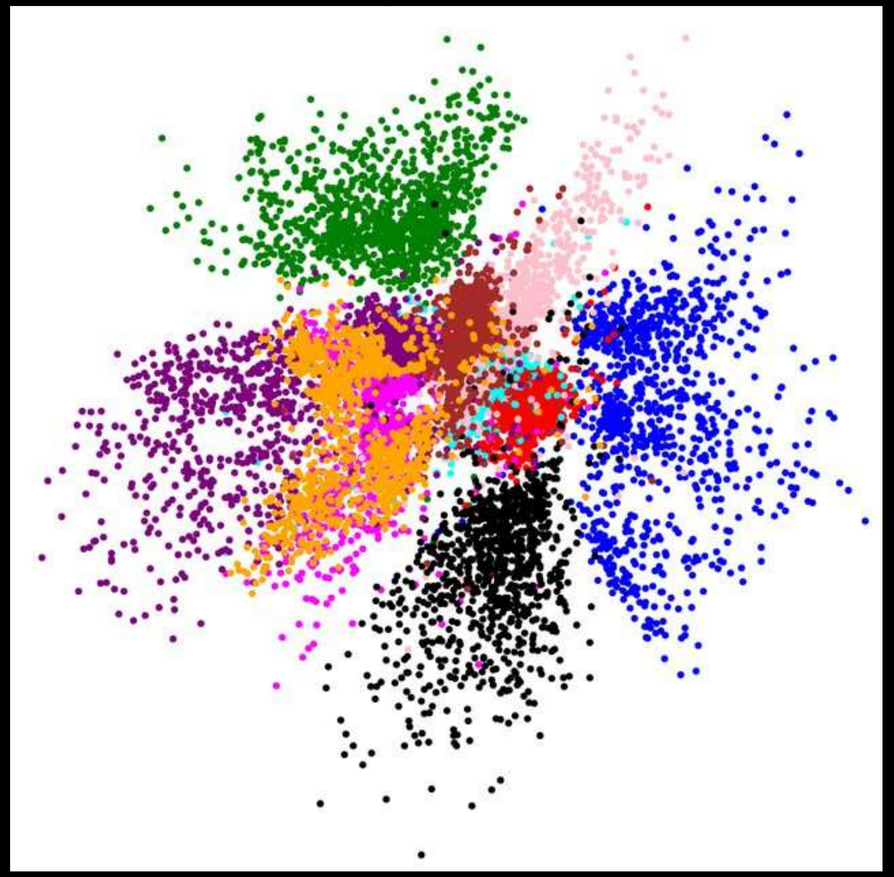
Variational Autoencoders (VAE) are models that encode images into a so-called "latent space". The decoder reconstructs the images from the encoded vectors, allowing the model to generate new images.

Latent Space



Latent Space

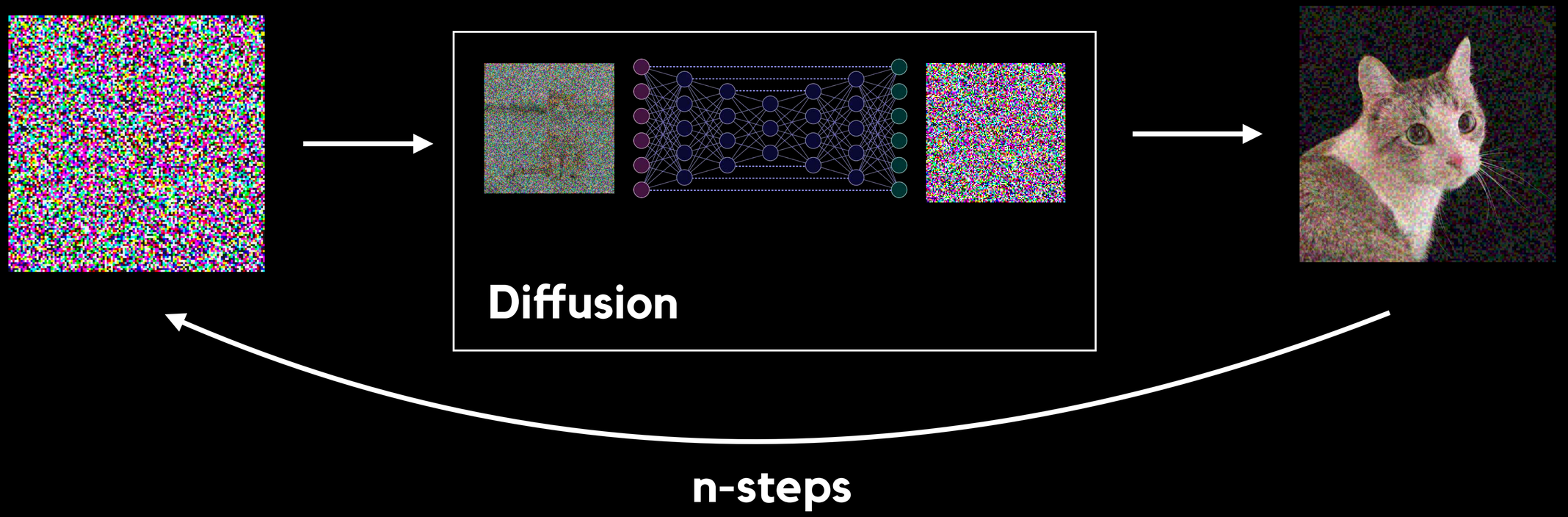
"An oil painting of cows in a field next to a windmill in Holland"



Exercise

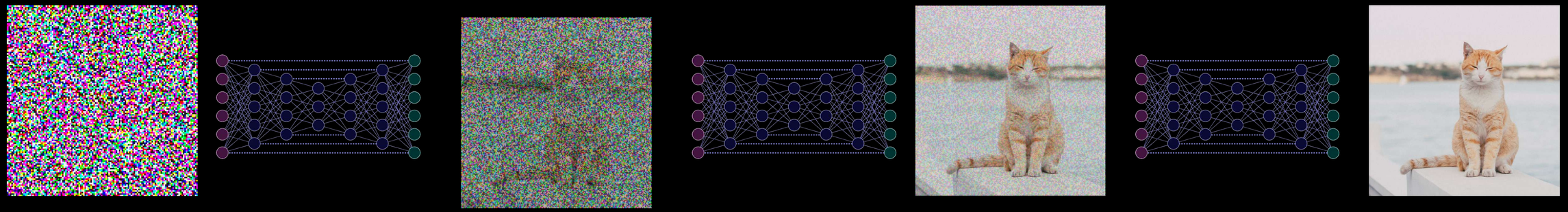
1. Open Hugging Face
2. Add your starting prompt
3. Add directional prompts
4. Create latent space walk

Diffusion method



Diffusion method

Amount of Noise = Schedule



t5 t4 t3 t0

n-steps

Diffusion method

CLIP

«a red cat»

Text Encoder

Image Encoder

1
5
7
4
7
8
3
4
5
2
3

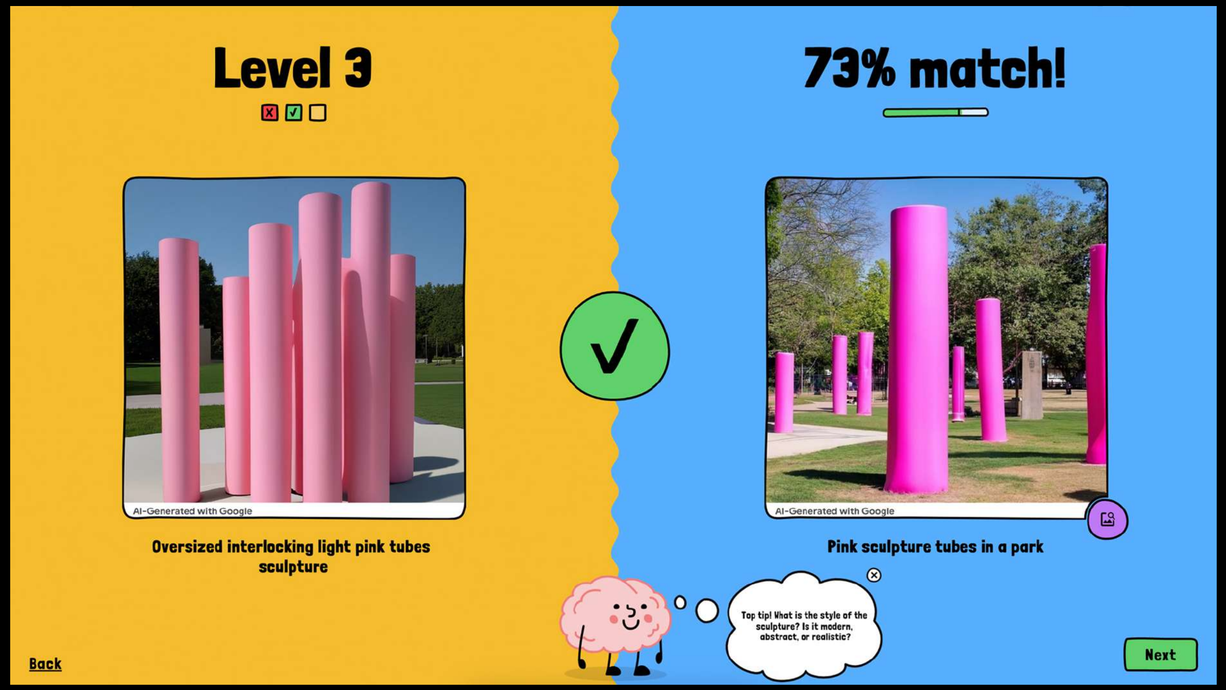
Embedding

Exercise

1. Open Hugging Face
2. Add your starting prompt
3. Add directional prompts
4. Create latent space walk

Exercise

1. Test your prompting skills with Say what you see.
2. Save one of the generated images on the disk.
3. Go to Moondream (vision language model) to see if the description matches the prompt.



How to apply Machine Learning?

How to apply Machine Learning?